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INCLUDING
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(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY
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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep; the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

ALERE FLAMMAM.

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THE
ANNALS AND MAGAZINE
OF
NATURAL HISTORY.

[ELEVENTH SERIES.]

> “ .... per litora spargite muscum,
> Naiades, et circùm vitreos considite fontes:
> Pollice virgineo teneros hìc carpite flores:
> Floribus et pictum, divæ, replete canistrum.
> At vos, o Nymphæ Craterides, ite sub undas
> Ite, recurvato variata corallia trunco
> Vellite muscosis e rupibus, et mihi conchas
> Ferte, Deæ pelagi, et pingui conchylia succo.”
> *N. Parthenii Giannettasi*, Ecl. 1.

No. 13. JANUARY 1939.

◆

I.—*New African Caddis Flies* (*Trichoptera*).

By MARTIN E. MOSELY, F.R.E.S., F.Z.S.

THE African Caddis Flies described in this paper have been mainly collected in the Belgian Congo by Dr. H. Schouteden, who very kindly put them into my hands for description.

Two species, however, *Goerodes darfurensis* and *G. saka*, the former from West Darfur and the latter from the Cameroons, were taken during expeditions made by Miss M. Steele, and sent to the Imperial Institute of Entomology, which kindly presented them to the British Museum.

It may be added that some of the species of *Leptocerus* from the Belgian Congo vary from the usual conception of this genus, but since they run down in the key to *Leptocerus*, it is perhaps, for the present, advisable to refrain from erecting a new genus to contain them.

It is of interest to note the presence of the genus *Pseudoneureclipsis* in Africa. Hitherto it has been recorded only from Russia and the Far East.

Goerodes darfurensis, sp. n. (Figs. 1–4.)

The insect was very badly crushed so it was necessary to clear it entirely in KOH before any description could be made. All that may be said about its general appearance is that it is yellowish in colour and probably without scales on the ♂ anterior wing. The species is very closely related to Ulmer's *sjoestedti*, but may be separated by the furcate apices of the outer pair of dorsal processes and the form of the inferior appendages.

Fig. 1.

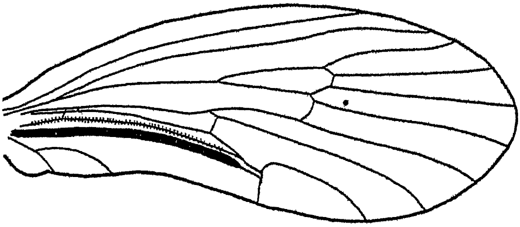
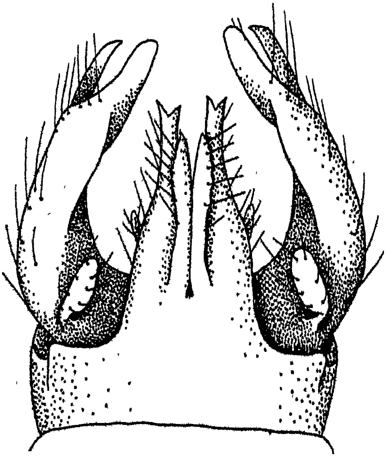
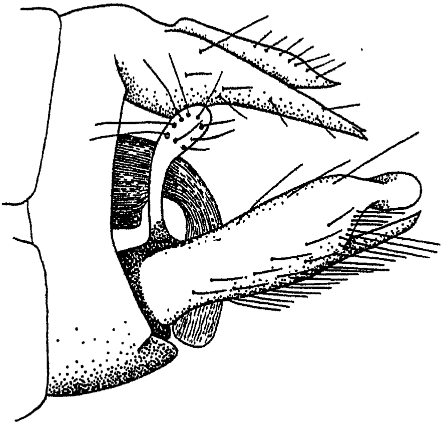


Fig. 2.



Goerodes darfurensis, sp. n., ♂.
Fig. 1.—Wings.
Fig. 2.—Genitalia, dorsal.

Fig. 3.



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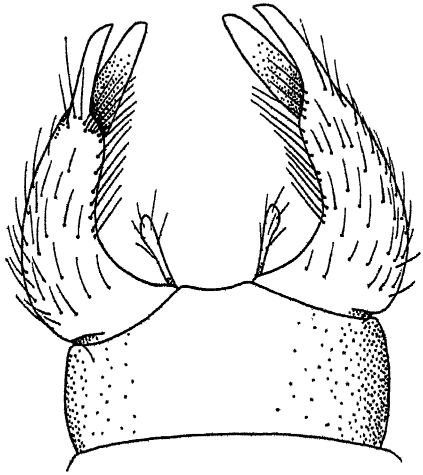


Goerodes darfurensis, sp. n., ♂.

Fig. 3.—Genitalia, lateral.
Fig. 4.—Genitalia, ventral.

Genitalia ♂.—Ninth segment produced at the centre of its dorsal margin in two pairs of processes, the inner long and slender, the outer rather longer, each process of the outer pair stout at its base, narrowing suddenly to a parallel-sided terminal portion, with a sharply excised apex; penis short, strongly arched, apex dilated, with its apical margin excised; inferior appendages four-branched, main branch stout with the lower margin heavily fringed with very coarse hairs, second branch arises towards the apex of the main branch; third branch arises from the upper margin towards the base, as seen from the side, short, curved, and with a strongly dilated apex; fourth branches, from beneath, situated at the extreme bases of the appendages on the inner margins, with slender stems and dilated apices.

Length of anterior wing, ♂ 13 mm.

W. Darfur: Jebel Murra, Killing, 7000 ft., 7. iv. 1932 (*M. Steele*).

Type ♂ in the collection of the British Museum.

Goerodes saka, sp. n. (Figs. 5–9.)

Head fuscous, oculi deep black; antennæ fuscous, basal joint rather less than the width of the head (with the oculi) in length, clothed with fuscous, thickened hairs; maxillary palpi membranous, two-jointed, with a tuft of very broad scales; labial palpi slender; wings fuscous, clothed with fuscous hairs and with small scales confined entirely to the nervures; anterior wing with forks nos. 1 and 2; discoidal cell long and narrow, slightly longer than its footstalk; posterior with fork no. 1 only, fourth apical cell extending inward as far back as the base of the discoidal cell; the wing short and rather broad; legs dark ochraceous, spurs 2, 4, 4.

Genitalia, ♂.—Ninth dorsal segment produced in a large plate, divided in two halves at its centre by a deep, narrow excision; each half is bifurcate, the upper fork short and rounded, the lower wide and deep, with an obliquely truncate apex; from the side, the upper fork is triangular, the lower wide and rounded; penis short, arching downward; inferior appendages five-branched, wide at the base, apex produced in a rather slender finger which makes the first branch; before the apex, on the inner side, is a wide excision the inner edge of

Fig. 5.

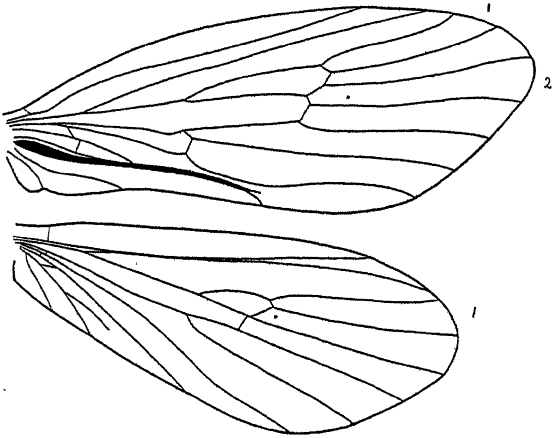
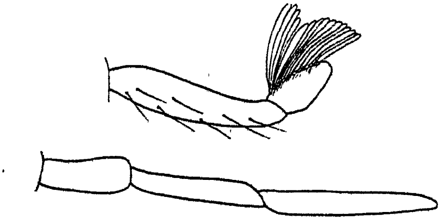


Fig. 6.



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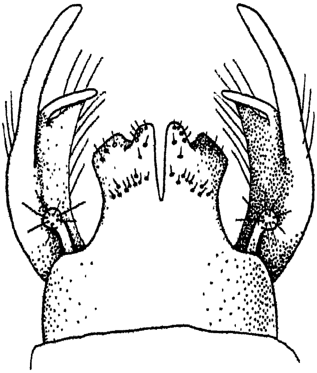

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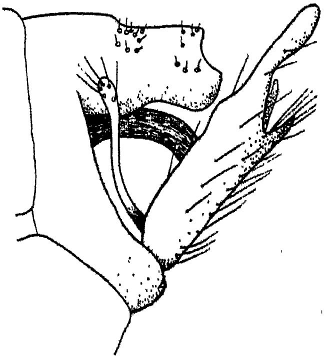


Goerodes saka, sp. n., ♂.

Fig. 5.—Wings.
Fig. 6.—Palpi.
Fig. 7.—Genitalia, dorsal.
Fig. 8.—Genitalia, lateral.

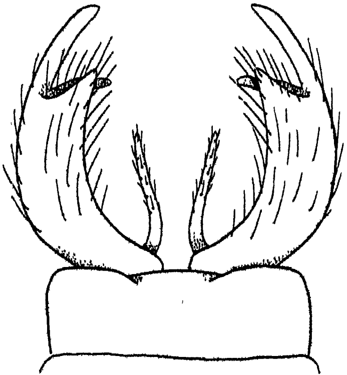
which is produced to make the second branch; in the centre of the excision is the third branch, very narrow and directed inwards; towards the base, from the side, there is a slender, sinuous fourth branch, directed upward, apex clavate; the fifth branch is slender and, seen from beneath, arises at the base of the appendage, directed tailward; it is rather more than half the length of the whole appendage.

Length of anterior wing, ♂ 7 mm., ♀ 8 mm.

Cameroons: Musake, 6350 ft., 9. i. 1932 (*M. Steele*).

Type ♂, paratypes ♂ and ♀, in the collection of the British Museum.

Fig. 9.



Goerodes saka, sp. n., ♂. Genitalia, ventral.

Leptocerus batia, sp. n. (Figs. 10–13.)

Insect rather large and dark yellowish.

Genitalia ♂.—The apical margin of the ninth tergite produced at its centre in two short processes; superior appendages long and slender, the apex of each furnished with a few long bristles; upper penis-cover broad at its base with an abruptly produced and slender apex as seen from above; from each outer basal angle of the cover there proceeds a very long, stout, downcurving spine; penis short and stout, apex dilated and bilobed, one lobe above the other, with a pair of plates attached to the sides of the lower lobe; the inferior appendages

Fig. 10.

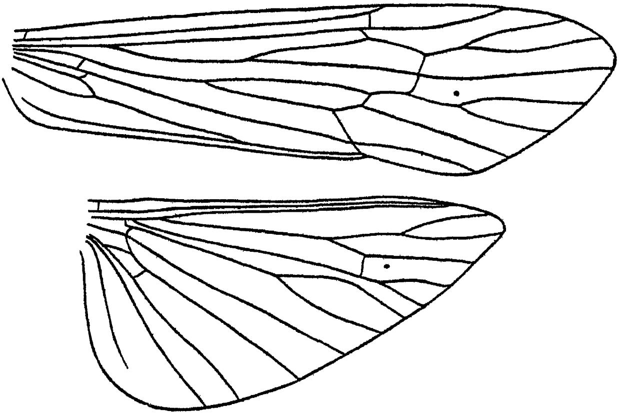
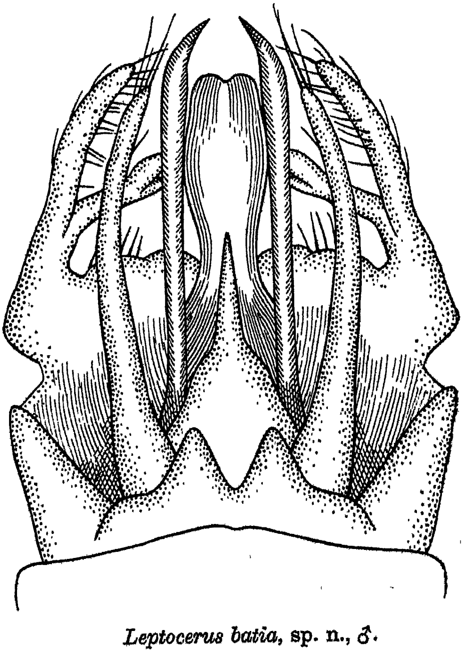


Fig. 11.



Leptocerus batia, sp. n., ♂.

Fig. 10.—Wings.
Fig. 11.—Genitalia, dorsal.

are furcate and arise from very large, irregularly shaped bases, which extend upwards within the margin of the ninth segment nearly as far as the upper penis-cover

Fig. 12.

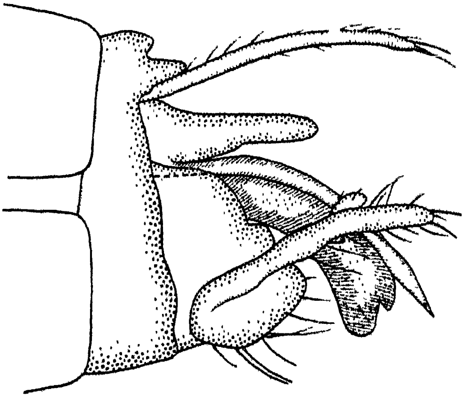
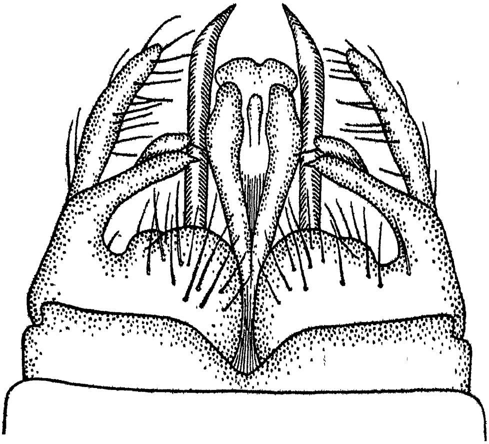


Fig. 13.



Leptocerus batia, sp. n., ♂.

Fig. 12.—Genitalia, lateral.
Fig. 13.—Genitalia, ventral, superior appendages omitted.

as seen from the side; there is a slender main branch and a stouter, inner, bifurcate branch, the latter arising at about midway; from beneath, the lower branch forms an inwardly directed claw; the base of the appendage, from the side, is notched along its apical margin, and from beneath, rounded at its inner margin; the margin of the ninth sternite excised at its centre.

Length of the anterior wing, ♂ 11 mm.

Belgian Congo: Kiou, Kibati, 5. ii. 1925 (*H. Schouteden*).

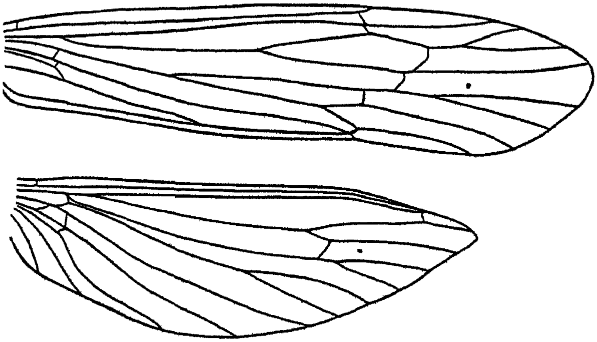
Type ♂ in the collection of the Musée du Congo Belge, Tervueren.

Leptocerus bomana, sp. n. (Figs. 14–17.)

Insect light yellowish; anterior wing rather narrow; posterior with with no dilation of the lower basal margin and with a very wide and short fork no. 1.

Genitalia ♂.—The apical margin of the ninth tergite produced at its centre in a pair of blunt, moderately long, finger-like processes, which are parallel-sided from the bases to the slightly rounded apices; between them is a pair of very slender processes, one longer than the other, sloping down over the penis and furnished at their apices with a few long bristles; upper penis-cover retracted towards the base of the penis, membranous, from the side with the apical margin slightly excised; penis stout, arching downward, upper surfaces trough-shaped; inferior appendages unbranched; rather broad

Fig. 14.



Leptocerus bomana, sp. n., ♂. Wings.

at the base; from the side, tapering to a subacute apex; from beneath, the inner margins are fringed and produced to make small shelves about midway; there is a longitudinal central ridge bearing one or two bristles; the

Fig. 15.

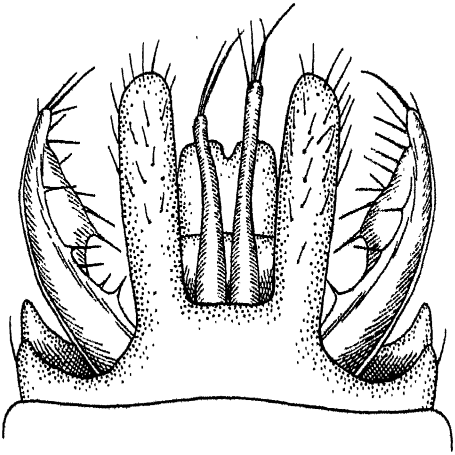
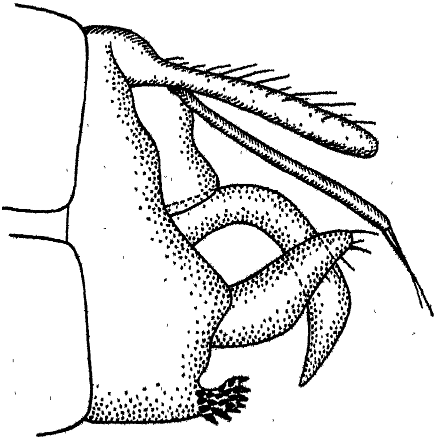


Fig. 16.



Leptocerus bomana, sp. n., ♂.

Fig. 15.—Genitalia, dorsal.
Fig. 16.—Genitalia, lateral.

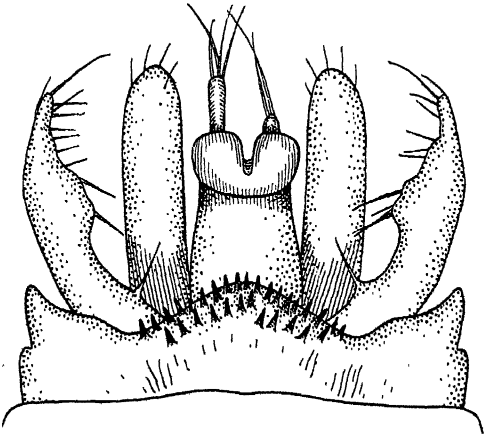
centre of the margin of the ninth sternite is produced in a wide triangle covered with dense setæ.

Length of the anterior wing, ♂ about 12·5 mm. (damaged).

Belgian Congo : Boma, xi. 1924 (*H. Schouteden*).

Type ♂ in the collection of the Musée du Congo Belge, Tervueren.

Fig. 17.



Leptocerus bomana, sp. n., ♂. Genitalia, ventral.

Leptocerus mandana, sp. n. (Figs. 18–22.)

Wings, both anterior and posterior, narrow ; pterostigma very much extended, a white spot in the costa on its basal side reaching into the discoidal cell ; the closing nervure of this cell is very small, so that it is acute at each end ; in the posterior wing, both subcosta and radius continue almost to the extreme apex of the wing. Spurs 2, 2, 2.

Genitalia ♂.—The centre of the margin of the ninth tergite is produced in two shallow lobes with an excision between ; beyond this the dorsal plate is produced in a pair of large, arching blades, from the apices of which arise long, downcurving, sinuous spines ; superior appendages slender ; upper penis-cover slender, terminating

Fig. 18.

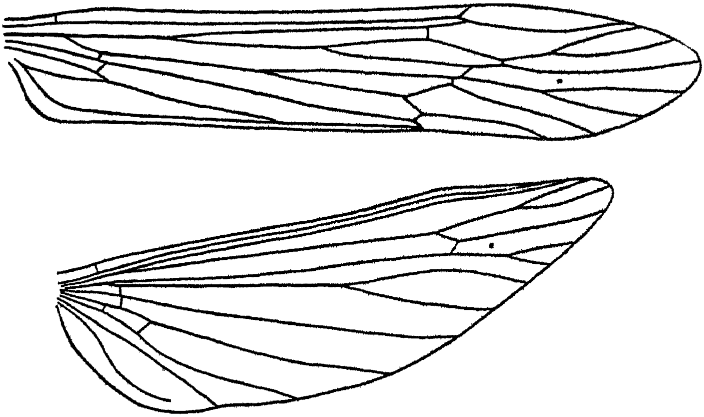


Fig. 19.

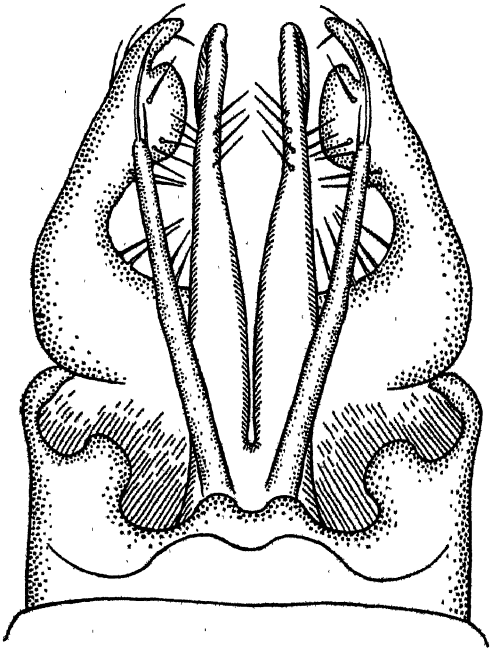
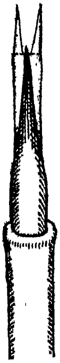


Fig. 20.



Leptocerus mandana, sp. n., ♂.

Fig. 18.—Wings.
Fig. 19.—Genitalia, dorsal.
Fig. 20.—Upper penis-cover.

in a pair of acute teeth with a dark and rather long spine lying above; penis arched, with a partly membranous apex; inferior appendages stout at the base, with a rounded plate arising on the inner margin near the apex,

Fig. 21.

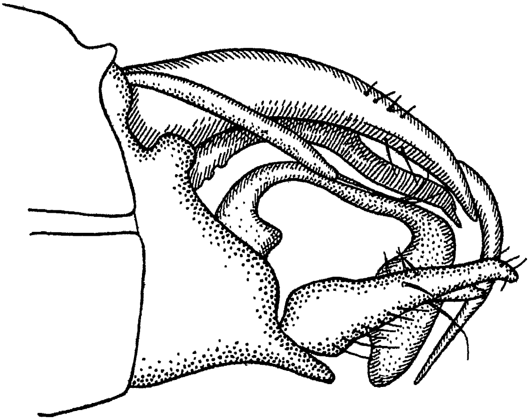
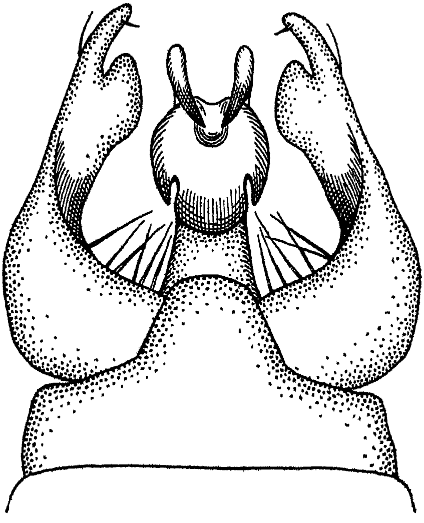


Fig. 22.



Leptocerus mandana, sp. n., ♂.

Fig. 21.—Genitalia, lateral.
Fig. 22.—Genitalia, ventral.

which is slender and slightly curved; the centre of the apical margin of the ninth sternite strongly produced.

Length of the anterior wing, ♂ 7 mm.

Belgian Congo: Manda, 27. iii. 1925 (*H. Schouteden*).

Type ♂ in the collection of the Musée du Congo Belge, Tervueren.

It is perhaps doubtful whether this is a true *Leptocerus*.

Leptocerus schoutedeni, sp. n. (Figs. 23–26.)

The insect was collected in spirit and is now bleached entirely white.

Genitalia ♂.—The apical margin of the ninth segment is produced in a blunt triangle on each side of which is a long, slender superior appendage; upper penis-cover, from both above and the side, broad and triangular, apex truncate; arising from each basal angle is a long, slender, sinuous spine; penis stout, very wide, arched, with a truncate apex, upper margins elevated in two parallel ridges with a deep furrow between; inferior appendages bifurcate; outer forks long and slender, somewhat membranous, fringed with stout bristles towards the apex; the second fork is of about half the length of the first and arises from its under surface; it is broad and terminates in an inturned, acute, strongly chitinised claw; from beneath, the appendages are very broad at their bases, each with a minute pointed process on its lower surface; there is an angular projection along the inner margin towards the apex of the second fork; apical margin of the ninth sternite widely and shallowly excised.

Length of the anterior wing, ♂ 9 mm.

Belgian Congo: Albertville? (*H. Schouteden*), type ♂; Albertville, 17. x. 1925 (*H. Schouteden*), paratypes ♂.

Type ♂, labelled as above, in the collection of the Musée du Congo Belge, together with paratypes ♂, labelled definitely Albertville. Two paratypes ♂ kindly presented by Dr. Schouteden to the British Museum.

There is some slight variation between the type of doubtful locality and the paratypes from Albertville, 17. x. 1925, mainly in the form of the inferior appendages and the ventral aspect of the penis. One paratype is damaged, both terminal forks of the inferior appendages being broken away.

Fig. 23.

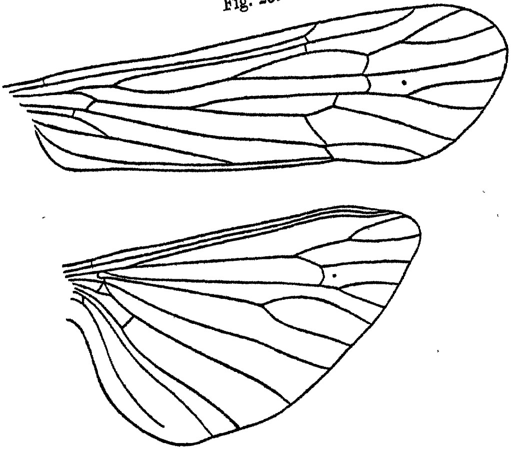
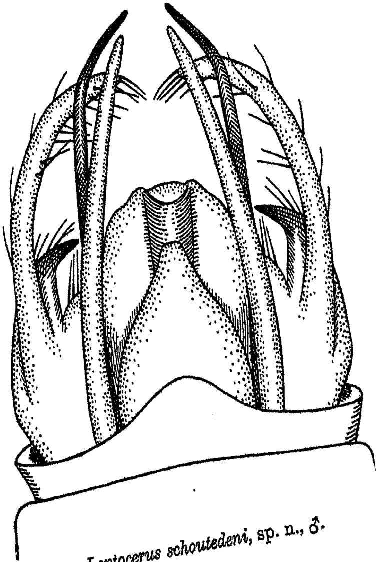


Fig. 24.



Leptocerus schoutedeni, sp. n., ♂.

Fig. 23.—Wings.
Fig. 24.—Genitalia, dorsal.

Fig. 25.

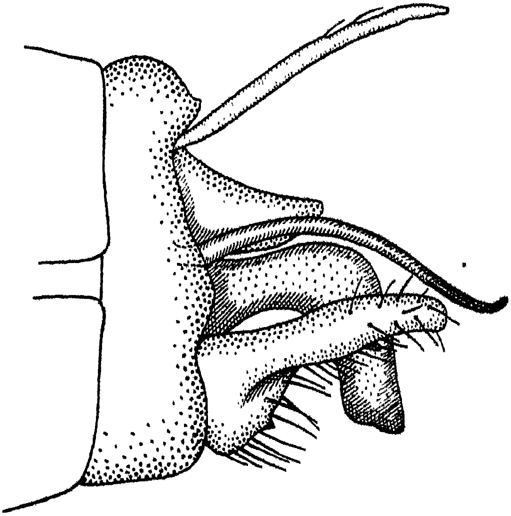
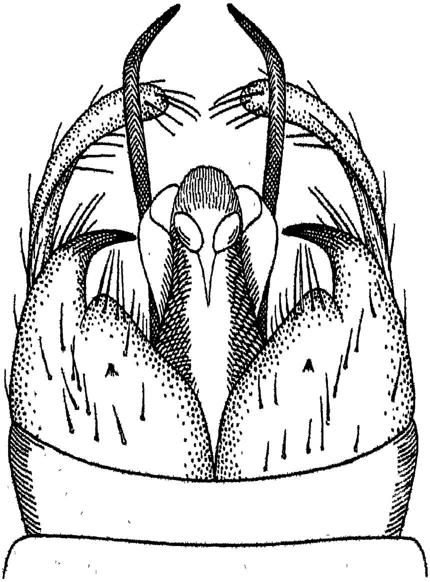


Fig. 26.



Leptocerus schoutedeni, sp. n., ♂.

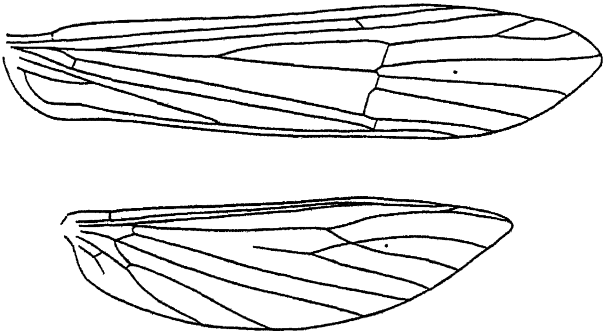
Fig. 25.—Genitalia, lateral.
Fig. 26.—Genitalia, ventral, superior appendages omitted.

Triænodes kimila, sp. n. (Figs. 27–30.)

The specimen was collected in alcohol and is now bleached to nearly white.

Genitalia ♂.—The apical margin of the ninth tergite is slightly produced and rounded; beneath it is an immensely long black spine, longer than the entire genitalia; from above it is broad at its base, narrowing to a sinuous, pointed apex directed to one side; on each side is a slender superior appendage, nearly as long as the central spine; penis large and downcurved, trough-shaped, apex excised; lower penis-cover with the lateral margins strongly elevated on each side of the penis, making a deep trough; inferior appendages branched; from the side, upper branch with the apex widely dilated, apical margin serrate; from its lower margin there arises a hair-like spine, directed slightly downward; lower branch itself branched; from beneath, the appendages are triangular on wide bases, with spur-like apices.

Fig. 27.



Triænodes kimila, sp. n., ♂. Wings.

Length of the anterior wing, ♂ 6·5 mm.

Belgian Congo: Likimi, 15. x. 1927 (*A. Collart*).

Type ♂ in the collection of the Musée du Congo Belge, Tervueren.

Fig. 28.

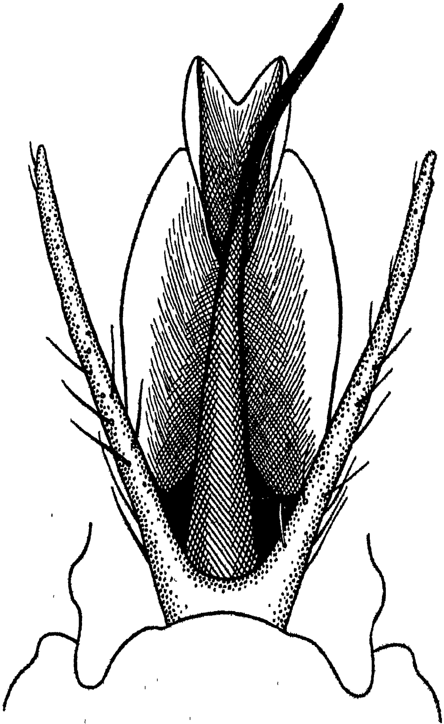
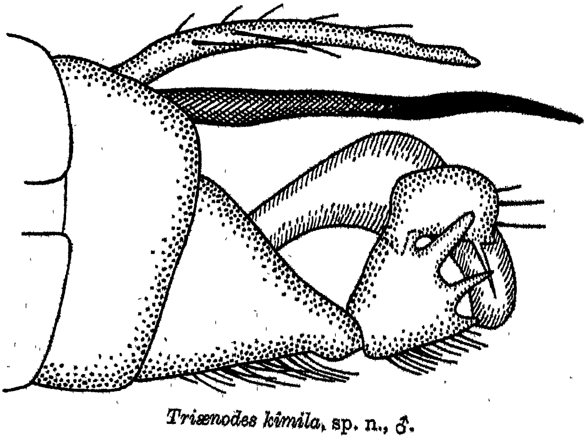
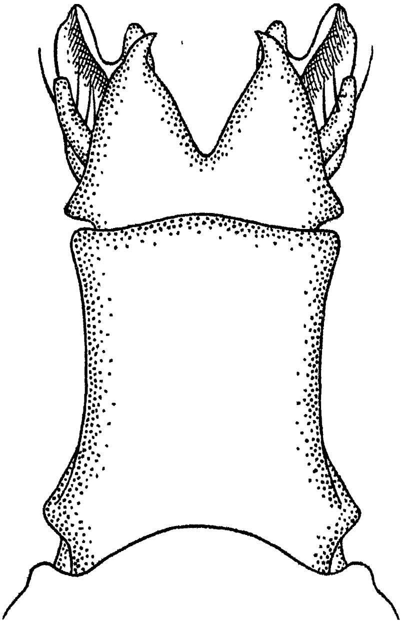


Fig. 29.



Triænodes kimila, sp. n., ♂.
Fig. 28.—Genitalia, dorsal.
Fig. 29.—Genitalia, lateral.

Fig. 30.



Triænodes kimila, sp. n., ♂. Genitalia, ventral.

Pseudoleptocerus congolensis, sp. n. (Figs. 31–34.)

There are several examples of the species, but in all, the wings are completely denuded of coloured scales. The markings of the membrane are indicated in the figure.

Genitalia ♂.—The apical margin of the ninth segment is produced, and welded to it is a pair of downcurved superior appendages (?) which, besides being welded to the ninth segment, are also welded to each other at their bases, so that, from above, there is a deep excision between them reaching to about midway; arising from each apex, on its lower surface, is a small, black, rod-like process or blunt spine; intermediate appendages welded together to make a triangular hood; upper penis-cover forming a flat plate with a rounded apex, from above, and with the lateral margins slightly turned down; penis short, with a pair of stout sheaths only visible from the side;

lower penis-cover plate-like, with a truncate apex directed distally and slightly downward; inferior appendages sinuous, arising from wide bases, strongly elbowed from

Fig. 31.

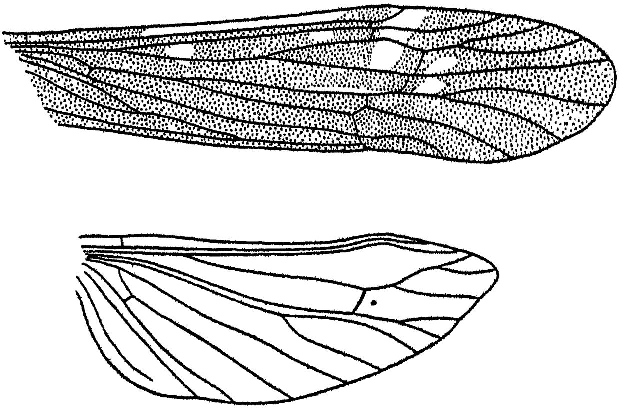
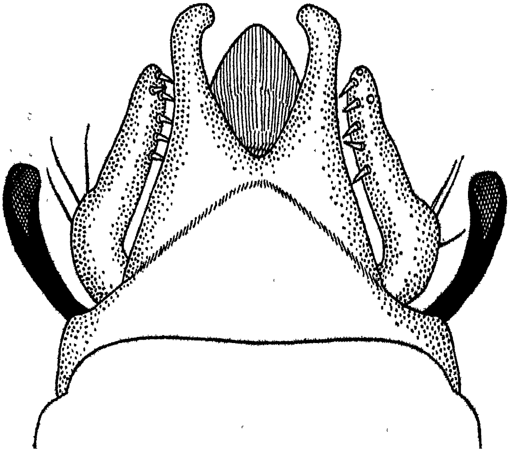


Fig. 32.



Pseudoleptocerus congolensis, sp. n., ♂.
Fig. 31.—Wings.
Fig. 32.—Genitalia, dorsal.

beneath, margins armed with stout, peg-like teeth; the margin of the ninth sternite is produced in a pair

Fig. 33.

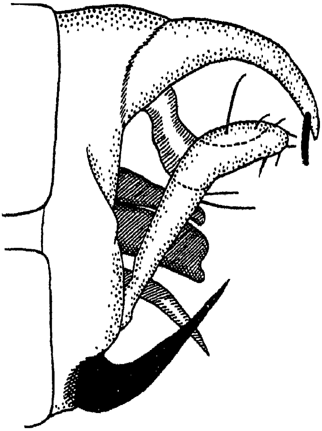
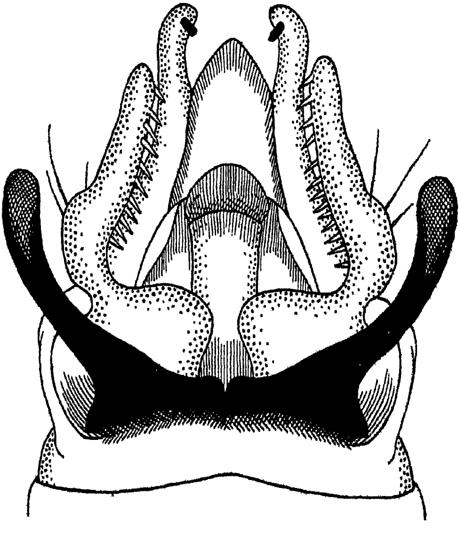


Fig 34.



Pseudoleptocerus congolensis, sp. n., ♂.

Fig. 33.—Genitalia, lateral.
Fig. 34.—Genitalia, ventral.

of widely outstretched black, caliper-shaped processes, which replace the usual ventral teeth or processes.

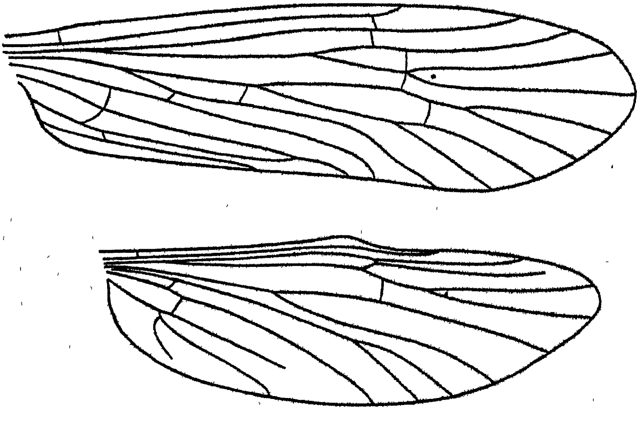
Length of the anterior wing, ♂ 6 mm.

Belgian Congo: Kwamouth, xi. 1924; Lokandu, 11. xi. 1925 (*H. Schouteden*).

Type ♂ and paratypes in the collection of the Musée du Congo Belge, Tervueren. Further paratypes in the British Museum collections.

Pseudoneureclipsis congolensis, sp. n. (Figs. 35–38.)

Insect brown; anterior wings with fork no. 1 wanting; posterior wing of one side with fork no. 3 wanting, but it is present in the other wing.



Pseudoneureclipsis congolensis, sp. n., ♂. Wings.

Genitalia ♂.—The ninth tergite is strongly produced, its apical margin bearing at its centre a pair of small processes, the rest of the margin being somewhat dentate; beneath, there is a pair of stout, blackened processes, possibly superior appendages, apices slightly divergent, outer margins serrate; penis long, furnished with a pair of sheaths, apex truncate; inferior appendages furcate, lower forks from the side, very large, nearly rectangular, apical margin slightly turned inwards over the apex to make a pocket; there is a small fork or branch situated along the upper margin, apex inturned and bearing exceedingly long bristles; a second branch or

Fig. 36.

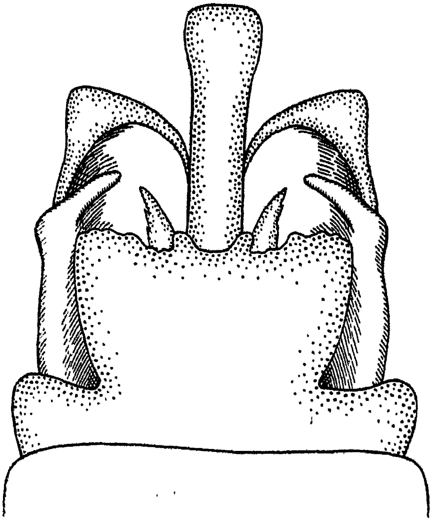
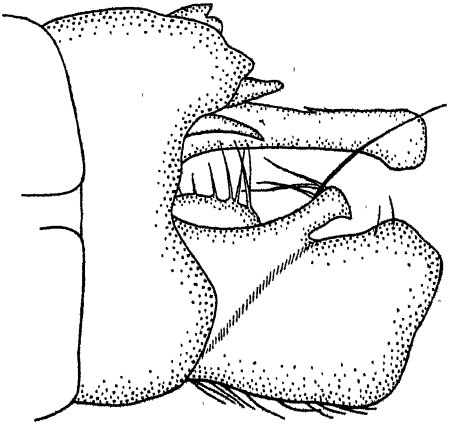


Fig. 37.



Pseudoneureclipsis congolensis, sp. n., ♂.

Fig. 36.—Genitalia, dorsal.
Fig. 37.—Genitalia, lateral.

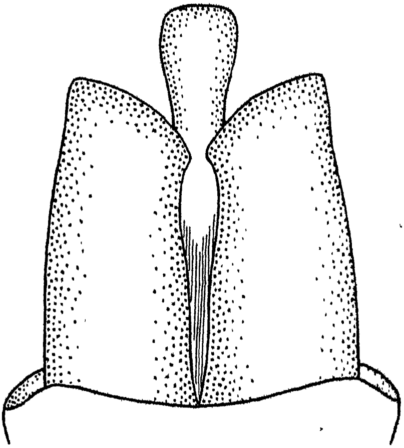
shelf arises within the appendages near its base, scarcely visible excepting from the side; it is broad and shallow, with the upper margin bearing five or six bristles.

Length of the anterior wing, ♂ 4 mm.

Belgian Congo: Stanleyville, ii. 1925 (*I. Chesoniere*).

Type ♂ in the collection of the Musée du Congo Belge, Tervueren.

Fig. 38.



Pseudoneureclipsis congolensis, sp. n., ♂. Genitalia, ventral.

Pseudoneureclipsis mlangensis, sp. n. (Figs. 39–41.)

Insect brownish; anterior wing with fork no. 1 present.

Genitalia ♂.—The apical margin of the ninth tergite is produced to form a dorsal plate, of which the centre is produced in a pair of large, rhomboidal processes; outer angles in stout, incurving claws; beneath this is a pair of stout, strongly chitinised processes, of which only the apices are visible, possibly superior appendages; penis short, with a pair of sheaths, apex truncate; inferior appendages as in *congolensis* but with the inner, fringed shelf completely concealed.

Length of the anterior wing, ♂ 5 mm.

Nyasaland: Mlanje, 7. iv. 1913 (*S. A. Neave*).

Type ♂ and paratypes ♂ and ♀ in the collection of the British Museum.

Fig. 39.

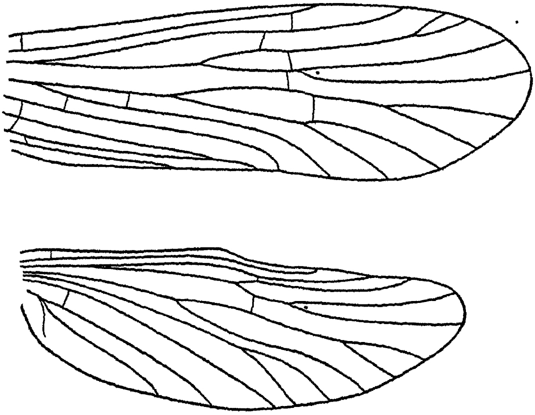
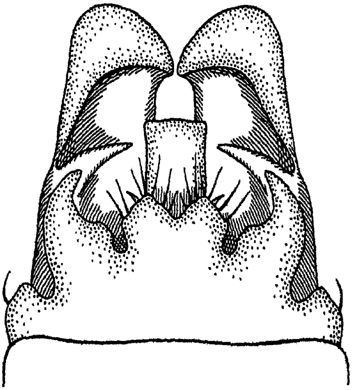


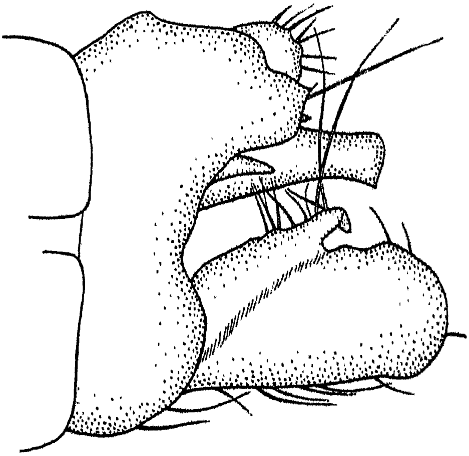
Fig. 40.



Pseudoneureclipsis mlangensis, sp. n., ♂.

Fig. 39.—Wings.
Fig. 40.—Genitalia, dorsal.

Fig. 41.



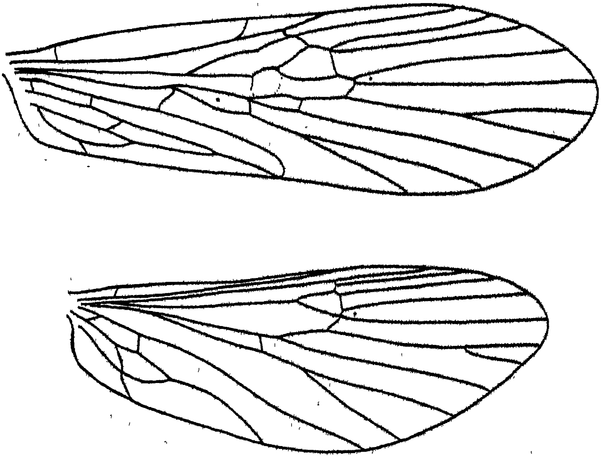
Pseudoneureclipsis mlangensis, sp. n., ♂. Genitalia, lateral.

Chimarrha ambaja, sp. n. (Figs. 42–46.)

The single example was collected in fluid, and all that may be said about its general appearance is that the wings are pale yellow and unmarked.

Genitalia ♂.—The apical margin of the ninth tergite is produced in a pair of irregularly rounded plates, set

Fig. 42.



rather far apart, arising from constricted bases, each with its basal inner angle produced in a long, sinuous, black spine, which is directed outwardly beneath and across the plate; there is a very small, superior appendage on

Fig. 43.

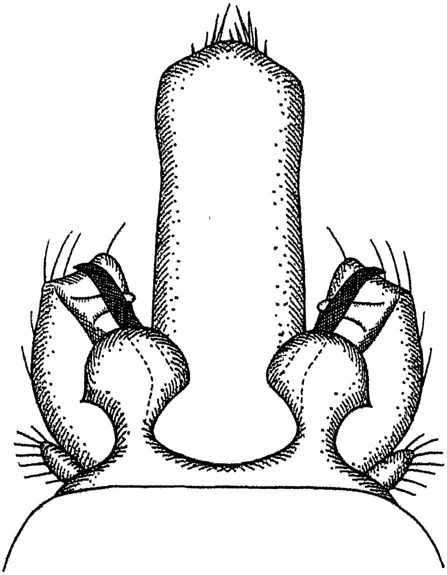
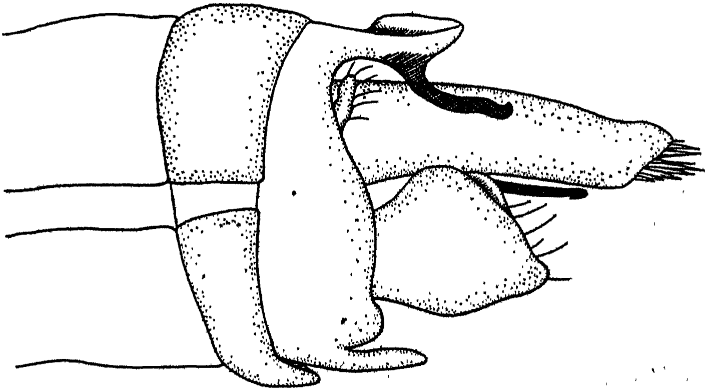


Fig. 44.



Chimarrha ambaja, sp. n., ♂.
Fig. 43.—Genitalia, dorsal.
Fig. 44.—Genitalia, lateral.

bristles at its apex situated on an inner tube; beneath, there is a pair of slender, hook-like sheaths, arising at a point towards the middle of the penis, bases nearly parallel and apices hooked inwards; inferior appendages large, nearly quadrate from the side; upper apical angles produced to form large, inwardly and downwardly directed hooks, each with an inner ridge towards the apical margin bearing a large, peg-like tooth; a strong process to the ninth sternite and a smaller one to the eighth.

Fig. 45.

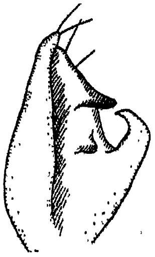
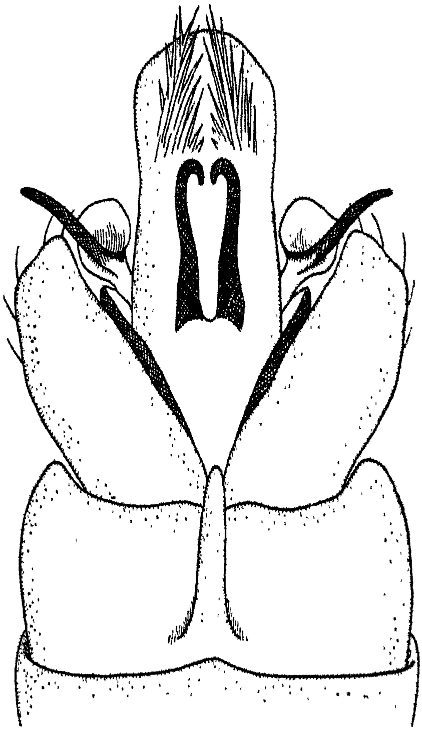


Fig. 46.



Chimarrha ambaja, sp. n., ♂.
Fig. 45.—Inferior appendage, from within.
Fig. 46.—Genitalia, ventral.

Length of the anterior wing, ♂ 4·5 mm.

Belgian Congo: Kjamba, 17. xii. 1924 (*H. Schouteden*).

Type ♂ in the collection of the Musée du Congo Belge, Tervueren.

II.—Hyale ramalhoi, *sp. n.* (*Crustacea, Amphipoda*).

By D. M. Reid, Department of Biology, Harrow School.

Individuals of this species occurred plentifully in rock pools about high-water mark amidst masses of green filamentous algæ. Undoubtedly the species is closely related to *Hyale perieri* (Lucas). The females of both species are very similar in appearance but differ clearly in the shape of the distal joint of gnathopod II—that of *H. perieri* being obpiriform, while that of *H. ramalhoi* is almost rectangular.

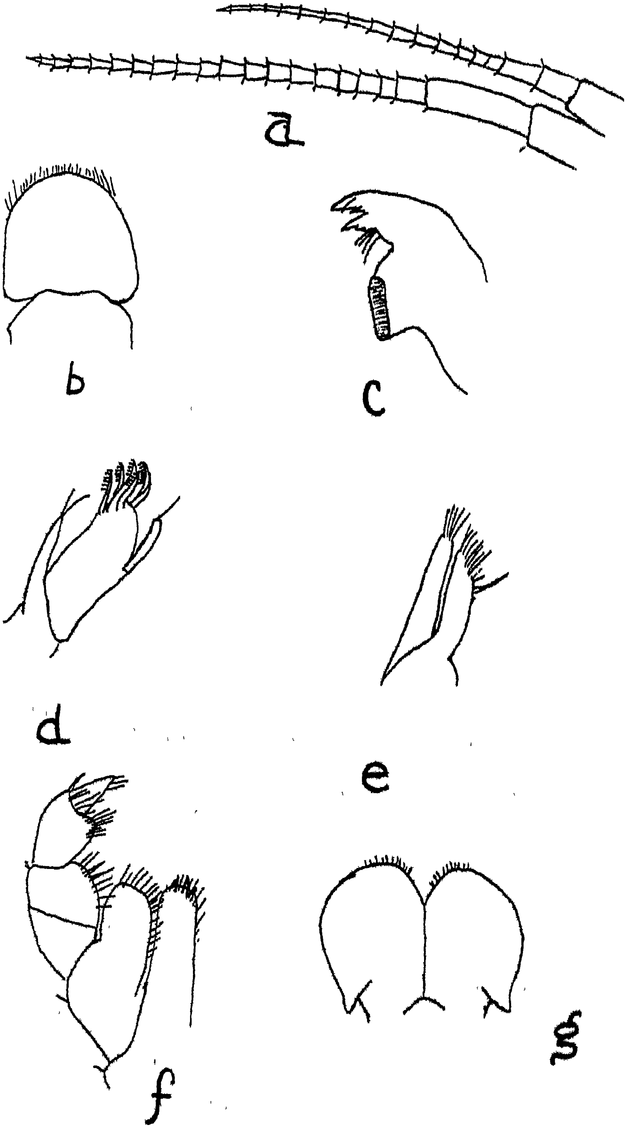
In the male there can be no confusion, because the finger of the second gnathopod (in the adult) is as long or longer than the terminal joint. This joint itself is deeply concave on the palmar edge, so that when closed the finger and hand form an open ovoid loop.

In juvenile males the terminal joint of the second gnathopod, although possessing the characteristic shape of the adult is, of course, smaller. The finger is also smaller in relation to the terminal joint. Thus it may extend little more than half-way along the palmar edge.

General Description.

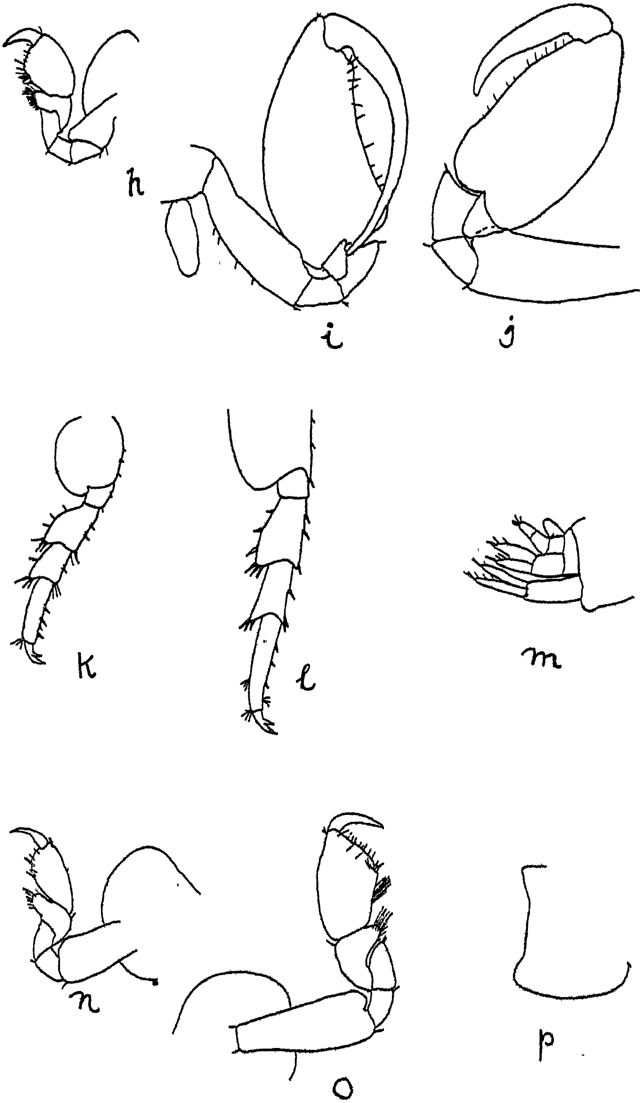
Male.—Length 6 mm. Colour whitish. First three coxal plates increasing in depths regularly. Third epimeral plate with a small rounded protuberance on the posterior angle. Eyes black, slightly reniform, set high. Both antennæ slender; first, with fifteen flagellar articulations, extends much beyond the peduncle of the second antenna. Second antenna has twenty articulations in the flagellum and is about half the length of the body. First gnathopod has distal joint roughly quadrangular. Second gnathopod large, proximal joint slender; distal joint long, almost concavo-convex; palmar edge with a few scattered setæ. Finger very long, smooth and curved, reaching at least to the base of the joint or beyond; posterior border very short. Peræopods fairly stout; third and fourth joints bear heavy spines on the posterior borders and distal ends. Posterior border of fifth joint in peræopod seven with a clump of bristles. The spine on the claws is very strong and gives the claw a bifurcated appearance. Third uropod has the

Fig. 1.



Hyale ramalhoi, sp. n.
a, 1st and 2nd antennæ ; *b*, anterior lip ; *c*, mandible ; *d*, 1st maxilla ; *e*, 2nd maxilla ; *f*, maxilliped ; *g*, posterior lip.

Fig. 2.



Hyale ramalhoi, sp. n.

h, 1st gnathopod, adult male; *i*, 2nd gnathopod, adult male; *j*, 2nd gnathopod, juvenile male; *k*, 5th peræopod; *l*, 7th peræopod; *m*, urosome; *n*, 1st gnathopod, female; *o*, 2nd gnathopod, female; *p*, 3rd epimeral plate.

branch as long as the peduncle. Telson cleft, unarmed and about as long as the peduncle of third uropod.

Female.—Length 4 mm. Ovigerous August, 9 eggs. Differs from male in that the gnathopods are sub-equal. The slightly larger second pair have an almost rectangular distal joint.

Locality and Habitat.

This species appeared to be the dominant one in the rock pools on the south shore of the Island of Madeira at Porto Novo. With it were found a few not quite typical specimens of *H. perieri* and one male specimen of *Microdeutopus chelifer* (Bate).

It is interesting to note that these were the only Amphipods found in the pools, and that their existence was probably only made possible by the masses of green filamentous algæ which afforded them shelter from the sun's rays.

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III.—*On a new Xeniid Genus* Efflatounaria. By H. A. F. GOHAR, Marine Biological Station, Ghardaqa, Red Sea.

[Plate I.]

IN a recent paper on the Xeniidæ of the Red Sea (Gohar, 1938 *b*), the genus *Anthelia* Savigny (1817) was finally removed from the Cornulariidæ to the Xeniidæ owing to the greater affinities it has to the latter family. The Xeniidæ were also divided into two subfamiles, viz.: (1) the Euxeniinæ with non-retractile polyps, comprising the four genera *Anthelia*, *Cespitularia*, *Xenia*, and *Heteroxenia*, and (2) the Neoxeniinæ with retractile polyps, embracing the single genus *Sympodium*. Some species of *Cespitularia* were described as possessing retractile polyps in contrast to the majority of its species. It seemed to me that the species with retractile polyps should be included in the Neoxeniinæ under a separate generic name, but I had not then seen any of the types of those species.

Subsequently, through the courtesy of Captain A. K. Totton, I have been allowed to study the collection of Xeniidæ at the British Museum (Natural History). I have thus been enabled to confirm my previous idea and to separate the species of *Cespitularia* with retractile polyps for which I propose the generic name *Efflatounaria*, subfamily Neoxeniinæ. The close relationship between *Efflatounaria* and *Sympodium* is indicated by some growth-forms of the latter genus. In the Red Sea *S. cæruleum* Ehrb. occurs in great abundance, growing as a membrane on the surface of coral rock, shells, or other solid substrata. The retractile polyps are often widely separated, but sometimes they may be so crowded as to press on one another at the base. Not uncommonly they fuse with one another up their sides to different levels, thus giving rise to an *Efflatounaria*-like stem.

Genus EFFLATOUNARIA, gen. nov.

Diagnosis: Xeniidæ with branched syndete, from the sides and summits of which the retractile polyps arise at different levels. Genotype: *tottoni*, sp. n.

The species *Cespitularia mantoni* Hickson has retractile polyps as described and illustrated by Hickson (1931, pl. i. fig. 3) and as also confirmed by the examination of the type. The name is thus changed here into *Efflatounaria mantoni* (Hickson). The following species, the types of which I have examined, are true *Cespitularia*: *C. wisharti* Hickson, *C. simplex* Thomson & Dean, *C. erecta* Macfadyen, and *C. stolonifera* Gohar (1938 *a*).

Specimens of the following species (not types) have non-retractile polyps and belong to the genus *Cespitularia*: *C. multipinnata* (Quoy & Gaimard), *C. mollis* (Brundin), *C. cærulea* May, *C. tæniata* May.

Efflatounaria tottoni, sp. n. (Pl. I.)

A medium-sized specimen from Low Isles, Great Barrier Reef of Australia, was described and referred to *Cespitularia wisharti* Hickson by Macfadyen (1936, p. 27).

I have carefully examined the type and other specimens of *Cespitularia wisharti* and cannot confirm Macfadyen in referring this specimen to that species. There are some points of similarity, particularly the absence of spicules and the size of the polyps, but I could not find any evidence of retractility in *C. wisharti*, which shows well-expanded polyps and tentacles. The form of the colony is also different, being much stouter and more fleshy in *C. wisharti* than in the present species, which is flattened and flabby with branches arising independently from the base of attachment instead of having a common stem as in *C. wisharti*. I have, therefore, to describe this specimen as a new species, *tottoni*, of the genus *Efflatounaria*.

Description of the specimen.—The colony arises from a base of attachment of the shape of a completely circular thin band about 8–10 mm. broad, round a roughly circular empty space in the middle about 8–12 mm. in diameter. It evidently grew round a branch of coral, or a similar substratum, just below the tip which passed through the circular space in the base of the colony. From the band-like base eight primary branches spring independently and in an oblique direction. The longest branch is about 3·5 cm. long and 1·3 cm. broad. They are flattened and thin at the base, where they are about 3 mm. thick, becoming thicker towards the tip (about 6 mm. at 5 mm. below the tip). Primary branches may give out at different levels secondary branches which may be either long, flat, and tongue-shaped, or short and lobe-like and as long as broad. Strap-like branches which may be forked at the tip and described by Macfadyen as "sucker-like outgrowths with oval attaching discs" are present. Thomson and Dean (Macfadyen) (1931, p. 34) also described similar structures in *Cespitularia simplex*. Macfadyen (1936, p. 28) thinks they are attaching outgrowths, but their general structure shows that they are not primarily so but are merely young branches. Their sometimes slightly swollen tips and their flattened stems are misleading at first sight, but, as mentioned above, older branches are often also flattened at the base and thick at the tip. Furthermore, a number of those strap-like young branches carry young polyps and only a few of them have indications of having been attached to other bodies, while the rest show no signs at all. Thus there is enough reason to believe that these are merely young branches, and, as the colony apparently grew on a branched coral, those branches of the alcyonarian that touched the coral were stimulated to flatten over its surface and attach themselves. Scondary attachments are developed in this way; sometimes these secondary attachments may take over the whole function of attachment, the primary being lost *, an obvious adaptation to sedentary life.

No polyps arise from the circular base of attachment; there are a few polyps near the bases of the branches and their number increases up the stems, their ends crowded with polyps. The polyp-walls are more or less transparent and show the places of attachment of the mesenteries as eight opaque longitudinal lines. The polyps are completely retractile and individuals showing all degrees of retraction are found. Thus some are completely retracted, their positions being indicated only by minute pores at the top of low domes, as is the case in the retracted polyps of *Sympodium cæruleum*. Other polyps are less retracted, while some are fairly well expanded and measure 2–2·5 mm. long (excluding the tentacles) and 0·8–1 mm. broad. In the majority of the polyps the tentacles are either retracted or very much contracted; where well expanded they bend towards the mouth. They are digitate and of a maximum length of 1 mm. and a breadth of 0·2–0·25 mm. The pinnules are difficult to detect, but in the more expanded tentacles they can be seen as minute cones arranged in one row of about six pinnules on each side of the tentacles. Spicules are entirely absent.

The specimen is male and spermaries near maturity and measuring up to 0·28 mm. in diameter swell out the mesenteries so as to fill the cœlenteric cavities of the polyps up to the tips of the branches.

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* This phenomenon is by no means rare among the Xeniidæ and Alcyoniidæ. I have often observed it in members of those families kept in the aquaria.

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EXPLANATION OF PLATE I.

Efflatounaria tottoni, sp. n.

IV.—*Descriptions and Records of Bees*.—CLXX.

By T. D. A. COCKERELL, University of Colorado.

ALL the bees recorded in this part are the property of the British Museum.

Allodapula albipennis (Friese).

This is the common species in S.W. Africa; the Ogilvies took it at Otavi, Omaruru, Windhoek, Usakos, and Okahondja. Further south, at Seeheim, in February, they collected eighteen specimens of *Allodapula*, and of these fourteen are *A. albipennis*. In the whole series only one female (Seeheim) has the clypeal mark with a transverse apical bar, as originally described by Friese. A male from Seeheim has black tubercles, but appears to be only a variety. The same is true of a male from Beaufort West, Nov. 25 (*L. Ogilvie*).

Allodapula longula (Friese).

S.W. Africa: Otavi, Dec. 25–26 (*J. Ogilvie, L. Ogilvie*). The female has the upper part of the clypeal mark subquadrate, without projecting points. Friese described it (from Windhoek and Usakos) as a variety of *A. albipennis*, but it seems to be a distinct species. I have seen one of the original specimens (from Windhoek) in the American Museum of Natural History.

Allodapula lacteipennis (Brauns).

♀.—Cape Province: Nelspoort, Dec. 3–5 (*J. Ogilvie*); Orange Free State; North Bank Halt, Norvals Pont, April 12 and 16 (*J. Ogilvie, L. Ogilvie*); S.W. Africa; Gobabis, Okahoa Farm, Dec. 16 (*L. Ogilvie*).

Two females from Seeheim, Feb. 15–16 (*J. O.*, *L. O.*), and one from Belmont, Feb. 24 (*J. O.*), represent the variety with a light spot on tubercles. All these females fall in Friese's table under *A. basizona* Friese, but agree with specimens received from Brauns.

Allodapula minutissima (Cockerell).

Cape Province: Beaufort West, Nov. 24 (*L. Ogilvie*).

Allodapula albomaculata Cockerell.

Cape Province: Mafeking, 1 ♂, 3 ♀, Feb. 28, March 1 (*L. Ogilvie, J. Ogilvie*); Bechuanaland, Palapye Road, March 3, 1 ♀ (*J. Ogilvie*).

The male is typical, though rather large (about 5 mm.). The female, which has not been described, is one of those puzzling forms which resemble *A. bukaviella* and *A. pogonias*. The wings are perfectly clear, with a dark stigma. The creamy-white clypeal mark has its upper margin concave, as described for *A. pogonias* (Strand). These females could well pass for *A. pogonias*, but the male is not at all the same as what I have considered male *A. pogonias*. It appears that there are several species which are easily recognizable in the male but almost alike in the female. As *A. pogonias* was based on a couple of females with no exact locality it may be impossible to identify it with certainty, but it seems best to accept my determination as given in Amer. Mus. Novitates, 840, p. 19, in the absence of any reason to the contrary.

Allodapula arcana, sp. n.

♂.—Length about 4 mm., anterior wing 3·5.

Black, the mesonotum and scutellum polished; face very pale reddish (presumably pale yellow in life), the shining clypeus entirely pale, the upper border slightly concave, the sides of the upper part nearly straight, small lateral marks next to the incisions; labrum with a light spot, mandibles entirely black; scape with a pale stripe, flagellum black; tubercles with a very narrow pale edge; tegulæ brown. Wings clear hyaline; stigma hyaline, with a strong dark margin. Legs black, including the basitarsi, tarsi pale brown at tip. Abdomen short and convex, with broad base; first tergite with a pair of widely separated tubercles.

Cape Province; Nelspoort, Dec. 5, 1933 (*J. Ogilvie*).

Certainly very close to *A. albipennis*, but distinct by the dark tarsi, and at least a subspecies. It is perhaps even closer to *A. elizabethana*, which is somewhat larger, with a black scape, the clypeal yellow more strongly constricted in middle, and the little lateral marks absent.

Allodapula otavica, sp. n.

♂.—Length about 5·5 mm.

Black, with highly polished mesonotum and scutellum; clypeus apparently yellow (reddened by cyanide in type), the upper margin of the yellow area straight, the sides gently curved, the part below the constriction of the same width as that above; conspicuous narrow lateral marks next to the constriction; labrum yellow; mandibles black; scape with a narrow light stripe; flagellum black; tubercles with a light spot; tegulæ hyaline, with a white dot. Wings perfectly clear; stigma pale, with a dark margin; nervures pale brown; first recurrent nervure meeting intercubitus. Legs black, with the tarsi brownish red; margins of tergites narrowly shining; first tergite with a strong transverse groove near the middle, this forming the posterior side of a modified triangular area, which appears shining, in contrast with the dull areas adjacent.

S.W. Africa: Otavi, Dec. 27, 1933 (*J. Ogilvie*).

Close to *A. albipennis* Friese, but larger, with red tarsi. It is not *A. flavolateralis* Ckll., on account of the perfectly clear wings and lateral face-marks. It is near to *A. rufitarsis* Ckll., but the venation is different and there are other differences. I had set aside three females (Otavi, Dec. 27, *J. O.*; Windhoek, Dec. 14, *J. O.*; Usakos, Jan. 16, *L. O.*) which I supposed to belong to this species, although the first recurrent nervure joins the second cubital cell an appreciable distance from its base. These females have light-spotted tubercles, and the face-mark is of the type of *A. maurula* (Ckll.). It is certainly not

A. maurula, by the perfectly clear wings, and the broader upper part of face-mark, which has distinct dentiform extensions pointing downward on each side. These females differ in size, the Usakos one being very small. In all three the face-mark is white. I have marked these *A. otavica* ?, but have no strong conviction that they belong there.

Allodapula dissimulans, sp. n.

♂.—Length about 5·5 mm.

Black, the mesonotum and scutellum shining, but the scutellum is not highly polished, the microscope showing a minute tessellation and scattered punctures; face dull light yellow, including practically all of the clypeus, the upper edge nearly straight, faintly concave, the sides of the upper portion gently rounded, a conspicuous lateral mark near the constriction on each side; labrum with a large yellow spot, and a very large yellow mark on mandibles; scape light in front, flagellum black, tubercles with a light spot. Wings greyish, not at all reddish; stigma dark brown; nervures brown, first recurrent joining second cubital cell at extreme base, second quite remote from apex. Legs black, with the tarsi entirely light red. Abdomen very convex, narrowed basally, shining upper face of first tergite moderately large, but hardly half as large as in *A. maurula*.

Natal: Durban, The Bluff, Oct. 1931 (*Alice Mackie*).

The greyish wings and large spot on mandibles at once separate it from *A. rufitarsis* Ckll. The shining scutellum indicates that it cannot be the male of *A. durbanensis* Ckll.

Allodapula powelli, sp. n.

♂.—Length about 5 mm., anterior wing 3·7.

Black, with mesonotum and scutellum highly polished; basitarsi white, small joints of tarsi brown; tubercles conspicuously margined with white; scape white in front; face-marks creamy-white, confined to clypeus and labrum, the mandibles black and lateral face-marks absent; the clypeal mark, practically covering clypeus, is broad, deeply constricted in middle, its upper margin straight; the sides of the upper portion are almost straight; tegulæ pellucid, with a small white spot. Wings hyaline, stigma solid brown, nervures brown; first recurrent nervure joins second cubital cell a considerable distance from base, second near apex (as in *A. nigrinervis* Cam.). Abdomen broad and convex.

Cape Province: Mafeking, Feb. 24, 1934 (*J. Ogilvie*).

Allied to *A. elizabethana* (Brauns), differing by the light stripe on scape and much larger upper part of clypeal mark. It is also to be compared with *A. maurula* (Ckll.), which agrees in lacking the little light marks near the median constriction of the clypeal mark; but in *A. maurula* the upper part of clypeal mark is much smaller and the lateral extensions of the lower part are angular, whereas they are rounded in *A. powelli*. The polished scutellum is also distinctive.

Allodapula badeni, sp. n.

♀.—Length about 5·5 mm.

In most respects agreeing with *A. powelli*. The white face-mark in the form of a T with short thick arms, and the stem tapering to a point, while the upper margin is strongly concave; scape, labrum, and mandibles all black; the wings differ from *A. nigrinervis* in that the nervures are not black and the first recurrent nervure is not more remote from base of second cubital cell than second from apex; tubercles with a white margin; first tergite with a very large quadrate sharply bordered median depression, its posterior margin on the border of the tergite. The clypeal mark is just like that of *A. nigrinervis* (Cam.). In my manuscript table this runs to *A. luckhoffi* (Ckll.), but it is considerably larger and more robust, and the upper corners of the face-mark are more produced.

Cape Province: Mafeking, Feb. 28, 1934 (*J. Ogilvie*).

I had described this as the female of *A. powelli*, but I am now so doubtful of this association that I set it forth as a distinct species.

The Mafeking species of *Allodapula* may be separated thus:—

Scutellum dull; male with lateral face-marks, female with stem of clypeal mark stout and the upper part subquadrate	*albomaculata* Ckll.
Scutellum highly polished	1.
1. Male, lateral face-marks (opposite median constriction of clypeal mark) absent	*powelli* Ckll.
Female, face-mark dagger-like	*badeni* Ckll.

Allodapula tuberculata, sp. n.

♂.—Length about 6 mm., anterior wing 4.

Black, with the mesonotum and scutellum polished; clypeus white, the upper margin of the white straight, the sides of the upper portion practically straight, little lateral marks at the incision, enclosing (between them and clypeal white) small white spots; lower corners of white area nearly rectangular; labrum with a large white spot; mandibles black; scape with a white stripe in front, flagellum black; tubercles white-margined; tegulæ hyaline, with a white dot. Wings clear hyaline, stigma pale brownish, with a darker margin, nervures pale; first recurrent nervure joining second cubital cell some distance from base, second at apex. Legs black, with the tarsi white, becoming pale reddish at end. Abdomen broad, nearly parallel-sided, the base broadly truncate; first tergite with a pair of conspicuous bosses on dorsal surface.

S.W. Africa: Okahandja, Jan. 25, 1934 (*L. Ogilvie*).

In my table runs to *A. rufitarsis*, which is much smaller, with reddish tarsi and the scape black. It is somewhat related to *A. maurula*, but the face-mark is quite different. Compared with *A. otavica* Ckll. it is at once separated by the broad abdomen with broad truncate base.

The following key will facilitate the separation of the males described above:—

	Scutellum dull; lateral face-marks present.	*albomaculata* Ckll.
	Scutellum polished	1.
1.	No lateral marks next to median constriction of face-mark	*powelli* Ckll.
	These lateral marks present	2.
2.	Front tibiæ entirely red; face orange; abdomen rufescent. (Weenen, *Thomasset.*)	*dichroa* (Strand).
	Front tibiæ not red; abdomen black	3.
3.	Stigma brown; tubercles with a light spot; tarsi light	*dissimulans* Ckll.
	Stigma very pale	4.
4.	Larger (5·5 mm. or over); tubercles conspicuously marked with light	5.
	Much smaller; tubercles black or almost ..	6.
5.	More robust, with white face	*tuberculata* Ckll.
	Less robust, with yellow face	*otavica* Ckll.
6.	Tubercles very narrowly edged with light; tarsi dark	*arcana* Ckll.
	Tubercles entirely black; tarsi light	*albipennis* (Friese), var.

Allodape strigata Brauns.

Cape Province: Bot River, Nov. 7–12, females (*J. Ogilvie*).

One specimen has a transverse very pale yellow band, with a linear median interruption, across base of scutellum. The wings are dark brown; the hair on hind tibiæ and tarsi is silvery white, the tibial patch red; the median stripe on clypeus is very slender. This may be known as var. *transcincta*, nov. (Nov. 10, *J. O.*). In Friese's table (1924) it would go to *A. junodi* Friese, the description of which nearly applies, except that in our insect the margins of the tergites are entirely black. As *A. junodi* came from Delagoa Bay it is improbable that it is our species.

Ceratina subulata Brauns.

Orange Free State: North Bank Halt, Norvals Pont, April 12, ♂ (*J. Ogilvie*).

Ceratina macrospila Cockerell.

S.W. Africa: Windhoek, Dec. 12, ♂ (*J. Ogilvie*).

Ceratina chrysorhina, sp. n.

♂.—Length about 7 mm.

Robust, black, with the margins of tergites 2 to 4 (interrupted in middle on 2) strongly fimbriate, the bands so formed slightly yellowish; the fifth has a very slender band and the sixth is thinly covered with white hair. Head broad, clypeus dull orange, hat-like, with the crown broadly rounded above, the sides sloping, the lateral extensions thick and obtuse; labrum with a large and long yellow mark, contiguous with clypeal yellow, deeply sulcate in middle (this mark like that of *C. mutescens* Ckll.) mandibles and antennæ black; thorax entirely black mesonotum polished and sparsely punctured in middle tegulæ very small, black. Wings clear hyaline, a little dusky at apex; stigma slender, dark red-brown; nervures dark. Legs black, with white hair, hind tibiæ with a long brush below, front tibiæ with a short white line on base; first three tergites strongly punctured, the others less strongly; small denticles at sides of abdomen beneath subapically, not visible when abdomen is seen from above.

S.W. Africa: Windhoek, Dec. 14, 1933 (*J. Ogilvie*).

In Friese's table this, *C. triodontura*, and *C. macrospila* run out at 6, having dark tarsi and light labrum. *C. chrysorhina* is near *C. fimbriatula* Ckll., differing by the yellow mark on labrum being longer than broad, the hat-shaped orange facial mark with a much broader crown, and the wings clear. The last character also separates it from *C. mutescens* Ckll.

Ceratina triodontura, sp. n.

♂.—Length about 5·3 mm., anterior wing about 4.

Black, with pubescence practically as in *C. chrysorhina*, the tergites strongly fimbriate; clypeus creamy-white, hat-like, truncate above, the sides sloping, the lateral extensions very obtuse; white mark on labrum approximately square (not transverse as in *C. vittata* Bingham); mandibles and antennæ black, the flagellum faintly brownish beneath; tubercles black; tegulæ black; wings dilute brownish; front tibia with a white stripe extending practically to end (as in *C. umtalica* Ckll., which has the clypeal mark orange); end of abdomen, seen from above, conspicuously tridentate.

S.W. Africa: Otavi, Dec. 26, 1933 (*L. Ogilvie*).

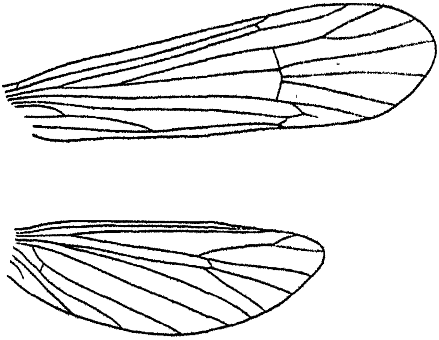
Near to *C. mutescens* Ckll., but smaller, with paler wings and white clypeus They practically agree in the appearance of the end of the abdomen. It is smaller than *C. macrospila*, which does not show the tridentate apex of abdomen.

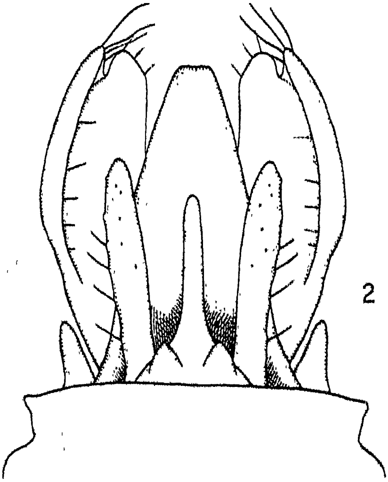
V.—*Trichoptera collected by J. Omer Cooper, Esq., in Egypt.* By MARTIN E. MOSELY, F.R.E.S., F.Z.S.

DURING an Expedition to Egypt, mainly to the oasis of Zeitoun, Mr. Omer Cooper obtained a few examples of caddis flies comprising two species, both of which are new to science.

One, a *Hydroptila*, is of particular interest as it is the first record of the family from Egypt. This species, *angustata*, belongs to the *sparsa* group, and is remarkable for the extreme length of the dorsal plate. The other species is a *Triaenodes*, a genus which, with *Hydroptila*, is distributed practically throughout the entire world.

Both were taken in the oasis of Zeitoun, of which Mr. Omer Cooper writes: "A very large, clear, swift-flowing spring, sides of ancient masonry, ... No fish. Much filamentous algæ."





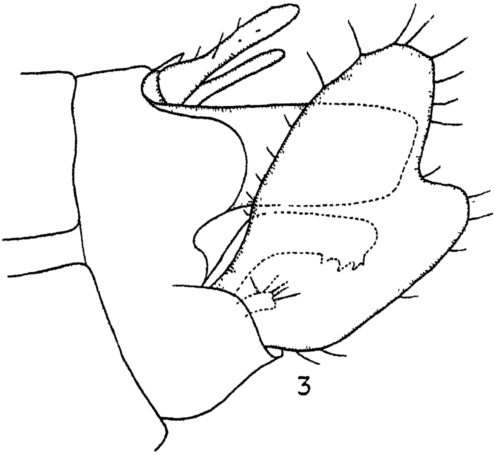
Triaenodes zeitounensis, sp. n., ♂.

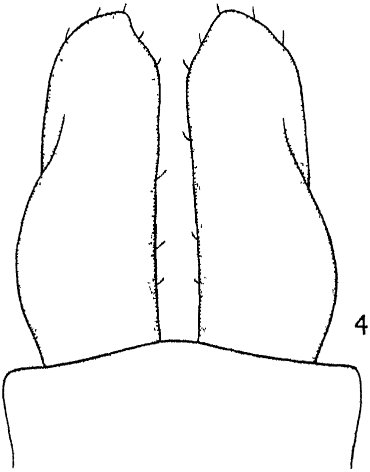
Fig. 1.—Wings.
Fig. 2.—Genitalia, dorsal.

Triaenodes zeitounensis, sp. n. (Figs. 1–4.)

The specimens were collected in alcohol and are bleached nearly white.

Genitalia ♂.—The apical margin of the ninth tergite produced in a short, finger-like, median process, with a very small triangular projection on each side at the base: superior appendages short, only slightly longer than the median process; beneath these is a long, wide, upper





Triaenodes zeitounensis, sp. n., ♂.

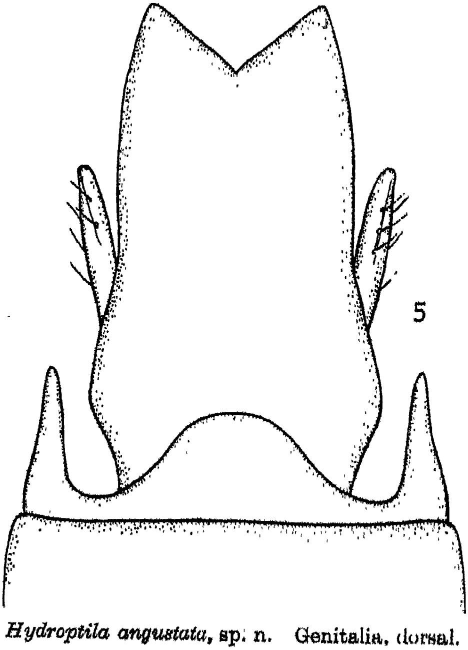
Fig. 3.—Genitalia, lateral.
Fig. 4.—Genitalia, ventral.

penis-cover, tapering to a blunt apex and covering a fleshy penis like a hood; inferior appendages very broad, bifurcate, deeply notched at their outer margins to form a large, triangular, upwardly directed apical portion; the margin at the base of the notch projects inwards to make a small fold, seen from above; the branch of the appendage can only be seen in a cleared example through its outer walls; it is short, arched, dilated gradually to a broad, truncate apex, as seen from the side, and is strongly dentate on the lower margin at the apex. Also only to be seen in a cleared preparation is another minute branch, arising at the base of the appendage on its inner side, with the apex armed with stiff bristles.

Length of the anterior wing, ♂ 5 mm.

Egypt: Zeitoun, 2. ix. (*J. Omer Cooper*).

Type ♂ and paratypes ♂ and ♀ in the collection of the British Museum.

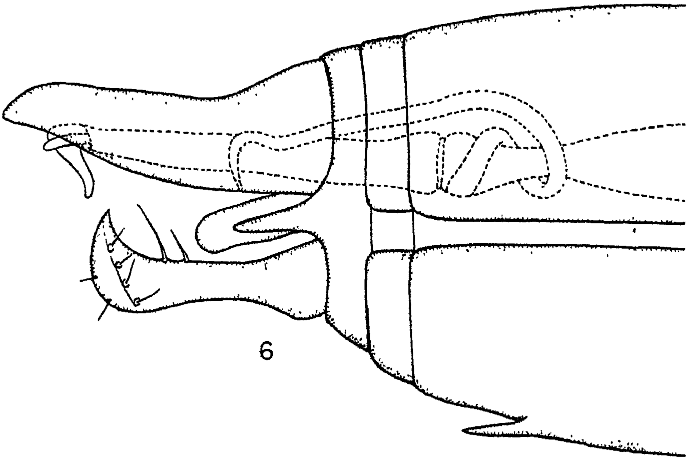


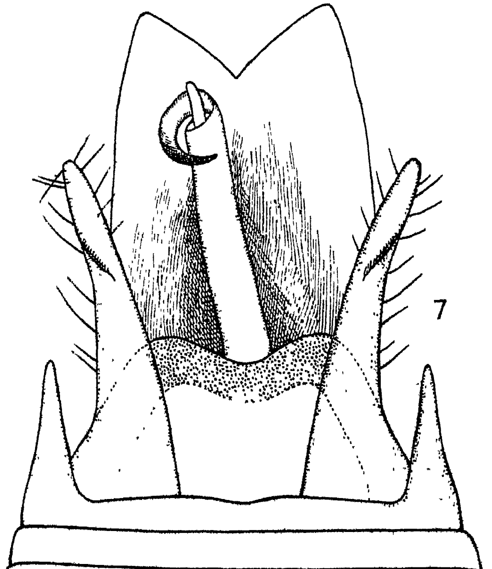
Hydroptila angustata, sp. n. Genitalia, dorsal.

Hydroptila angustata, sp. n. (Figs. 5–8.)

The new species belongs to the *sparsa* group.

Antennæ twenty-nine jointed in the ♂; scent-organ, in the form of two eversible filaments, clothed with

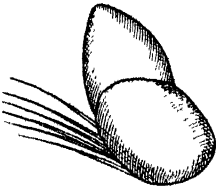




Hydroptila angustata, sp. n., ♂.
Fig. 6.—Genitalia, lateral.
Fig. 7.—Genitalia, ventral.

dark hairs, lying beneath scent-organ caps which are somewhat produced at their apices.

Genitalia ♂.—The apical margin of the ninth tergite is produced and rounded; beyond it is a long and rather narrow dorsal plate with only slight dilatations of the lateral margins at the base; apical margin deeply excised from the extreme apical angles; side-pieces of the ninth segment fairly long and acute; penis with a hook curling across it at the apex; lower penis-cover wide, slightly excised at its apical margin, which is more strongly chitinised or pigmented than the rest of the structure; inferior appendages rather broad, dilated at the apices, the margins of which, from the side, are bluntly rounded and slightly out-turned, with a strong spur at the upper apical angle and a black wart at the lower angle; ventral process rather long and very acute.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Hydroptila angustata, sp. n., ♂. Scent-organ cap.

Length of the anterior wing, ♂ 2 mm.

Egypt: Zeitoun, 2. ix., Siwa, 4. viii. (*J. Omer Cooper*).

Type ♂ and paratypes ♂ and ♀ in the collection of the British Museum.

VI.—*New African Species of* Dasychira (*Lepidoptera,* Lymantriidæ) *in the British Museum Collection.* By C. L. Collenette, F.R.E.S.

[Plate II.]

The majority of the insects described in the present paper have been standing in the British Museum collection for a considerable period. Apart from certain single specimens which I do not wish to describe until further material comes to hand, and other specimens whose relation to species not represented in the Museum is still uncertain, I have now dealt with all the undescribed African species of the genus *Dasychira* with which I am acquainted.

Dasychira gonophoroides, sp. n. (Pl. II. fig. 9.)

♂. Resembles *Dasychira gonophora* Holland, but the postmedial fascia of the fore wing is differently formed, being sinuous between veins *R*3 and *M*1 and running oblique outwardly from vein *Cu*2 to the inner margin.

Expanse, ♂ 35 mm.

1 ♂ (holotype), Bingerville, Ivory Coast, September 1915 (*G. Melou*). A ♀ from Anambara Creek, Niger, in rather poor condition, is probably conspecific.

I have compared the above insect with a long series of *D. gonophora* in the British and Tring Museums, and have no doubt that it represents a different species. A paratype ♂ of *D. gonophora* is illustrated in the plate (fig. 10) for the purpose of comparison.

Dasychira phaleroides, sp. n. (Pl. II. fig. 5.)

♀. Palpus pinkish buff, on the outer side bistre. Antennal shaft light buff, pectinations cinnamon-buff. Head, body, and legs tawny olive mixed with whitish, pinkish buff, and snuff-brown, giving a drab effect. Fore wing drab; a conspicuous fuscous subbasal fascia running straight across the wing, and beyond it a whitish circular patch stretching from the lower margin of the cell to the anal vein; a fuscous-black edging to the discocellulars, bowed, concavity terminad, the marking continued between veins *Cu*1 and *Cu*2 almost to the termen, and upwards to the costa; a very large light buff patch occupying the whole of the apex, marked in the proximal half with Sudan-brown, and with Brussels-brown markings at the termen between the ends of veins *R*3 and *R*4, *M*2 and *M*3, and *Cu*1 and *Cu*2; fringe light buff marked with Brussels-brown. Hind wing and fringe pale pinkish buff; a broad snuff-brown subterminal shade, not reaching the costa, finishing at the anal angle. Under side of both wings and fringes pale pinkish buff, the darker markings of the upper side reproduced with the exception of the subbasal fascia of the fore wing.

Expanse, ♀ 65 mm.

1 ♀ (holotype), Johann-Albrechts Höhe Station, Cameroons, 1896 (*L. Conradt*).

This handsome species is not closely related to any other in the genus. It may perhaps be placed near to *Dasychira antica* Walker.

Dasychira eclipes, sp. n. (Pl. II. fig. 18.)

♂ & ♀. In pattern of fore wing rather closely resembles *Dasychira exoleta* Bethune-Baker. However, the wing expanse is greater, the antennæ considerably larger, and the hind wing quite dissimilar, being pinkish buff, with a well-defined dark streak on the discocellulars and a dark shade over the apical and terminal areas. The ♂ genitalia show strong specific differences.

Expanse, ♂♂ 40–41 mm., ♀ 49 mm.

1 ♂ (holotype), Durban, Natal, 5th January, 1909 (*E. L. Clark*); 1 ♀ (allotype), Durban, March 1907 (*G. F. Leigh*); 1 ♂ (paratype), Congella, Durban (*G. F. Leigh*).

Professor Janse appears to make no mention of this species in his most useful paper on the South African Lymantriidæ, although he had material both from G. F. Leigh and E. L. Clark.

Dasychira soyensis, sp. n. (Pl. II. fig. 17.)

♂. Palpus buckthorn-brown, on the outer side darker. Antennal shaft buckthorn-brown, shading to fuscous at the tip; pectinations fuscous. Head and thorax buckthorn-brown, mixed on the thorax with fuscous. Abdomen fuscous, with buckthorn-brown dorsal tufts on the basal segments. Pectus, venter, and legs fuscous mixed with hair-brown; mid- and hind tibiæ and tarsi buckthorn-brown mixed with fuscous. Fore wing fuscous; a broad streak of tawny olive, irrorated with Prout's-brown, along the inner margin from tornus to base, reaching vein *Cu*2 and the cell; a crenate tawny-olive postmedial fascia, bowed (convexity terminad) from the costa at two-thirds to vein *Cu*2, thence at right angles to the inner margin, which it meets at three-fourths; a series of interneural subterminal fuscous-black spots, becoming larger towards the tornus, those below *M*3 having a background of tawny olive; fringe fuscous. Hind wing and fringe whitish, shaded with fuscous in the apical area. Under side of fore wing and fringe fuscous, inner marginal area whitish. Under side of hind wing and fringe whitish, apical area shaded with fuscous.

♀. Resembles the ♂, but with the hind wing darker.

Expanse, ♂ 32 mm., ♀♀ 37–42 mm.

1 ♂, 1 ♀ (holotype and allotype), from larvæ taken in July 1937 at Soy, Kenya; 1 ♀ (paratype), August 1937, Soy (*G. W. Jeffery*).

Larvæ feeding on a species of *Loranthus* with orange-red flowers, in forest.

May be placed near to *Dasychira scotina* Hering.

Dasychira kivuensis, sp. n. (Pl. II. fig. 2.)

♂. Palpus Prout's-brown. Antennal shaft clay-colour, pectinations tawny olive. Head, thorax, abdomen and fore leg Saccardo's-umber mixed with clay-colour, with fuscous dorsal tufts on the basal segments of the abdomen; middle and hind-leg missing in the type. Pectus and venter pinkish buff. Fore wing Prout's-brown; a fuscous subbasal fascia, with a prominent patch of pale pinkish buff proximally between the cell and the inner margin; some pinkish-buff markings at intervals along the costa to the apex; a prominent pale pinkish-buff patch postmedially from costa to vein *M*3, with a crenate postmedial fascia, points on the veins, concavities terminad, running through it and continued to the inner margin; a subterminal fascia formed of light interneural streaks; a pale pinkish-buff preterminal fascia, broken at the veins; fringe Saccardo's-umber, cinnamon-buff at the vein-ends. Hind wing and fringe Saccardo's-umber, mixed on the fringe with cinnamon-buff. Under side of fore wing tawny olive; discocellulars edged with Saccardo's-umber, and an almost straight postmedial fascia of the same colour; costa narrowly edged with cinnamon-buff; fringe cinnamon-buff, Saccardo's-umber between the vein-ends. Under side of hindwing tawny olive; a patch of Saccardo's-umber on the discocellulars, and postmedial and subterminal fasciæ of the same colour; fringe cinnamon-buff, mixed with Saccardo's-umber.

Expanse, ♂ 28 mm.

1 ♂ (holotype), Lowowo Valley, South Lowa District, W. Kivu, 4000 ft., mountain forest, wet season, March 1904 (*T. .A Barns*).

May be placed near to *Dasychira ænotata* Tams.

Dasychira omodepseta, sp. n. (Pl. II. fig. 8.)

♀. Palpus cinnamon-buff mixed with Saccardo's-umber. Antennal shaft Saccardo's-umber irrorated with pale pinkish buff; pectinations sepia, tipped with cinnamon-buff. Head, thorax, abdomen, and legs Saccardo's-umber mixed with tawny olive and pinkish buff, the pectus and venter lighter; sepia dorsal tufts on the basal segments of the abdomen. Fore wing Saccardo's-umber; a patch of ochraceous tawny at the base of the wing, between the lower margin of the cell and the anal vein, edged distally with a fuscous-black subbasal fascia, which does not reach the costa or inner margin; traces of an antemedial and a postmedial fascia of fuscous-black, the latter slightly bowed (convexity terminad) from the costa to vein *Cu*2, thence oblique inwardly to the inner margin; a subterminal and a preterminal fascia of fuscous-black, broken at the veins, roughly parallel with the termen, the subterminal patches below veins *Cu*1 and *Cu*2 edged distally with a few scales of pale pinkish buff; fringe Saccardo's-umber. Hind wing and fringe drab. Under side of both wings and fringes drab, with traces of a darker postmedial fascia on the fore wing, and, on the hind wing, a dark mark on the discocellulars and postmedial and subterminal fasciæ.

Expanse, ♀♀ 40–43 mm.

1 ♀ (holotype) and 1 ♀ (paratype), Mt. Elgon, December 1931 and November 1934 (*T. H. E. Jackson*). A ♂ with an expanse of 33 mm. from Rugege Forest, Ruanda District, Lake Kivu, 7000 ft., December 1921 (*T. A. Barns*), is similarly marked and apparently conspecific.

Dissimilar from any other African species of *Dasychira*, but perhaps nearest to *D. sphalera* Hering. The patch of ochraceous tawny at the base of the fore wing is a distinctive feature.

Dasychira elgonensis, sp. n. (Pl. II. fig. 15.)

♂. Palpus pinkish buff, on the outer side Prout's-brown. Antennal shaft and pectinations pinkish buff, the shaft heavily irrorated with mummy-brown. Head and thorax pinkish buff mixed with mummy-brown. Abdomen Prout's-brown, mixed on the basal segments with pinkish buff, and with dorsal tufts of fuscous-black; anal tuft pinkish buff tinged with buckthorn-brown. Pectus, venter, and legs pinkish buff to light buff, mixed on tibiæ and tarsi with mummy-brown. Fore wing buckthorn-brown; a subbasal fascia of mummy-brown, the space between this fascia and the antemedial fascia, from costa to lower margin of cell, filled in with mummy-brown; the central portion of the antemedial fascia, from the upper margin of the cell to below the lower margin, composed of a conspicuous oblong figure of mummy-brown, outwardly oblique; discocellulars edged with mummy-brown; some faint postmedial markings of mummy-brown, with a patch of mummy-brown on the costa and a preterminal fascia of the same colour broken at the veins; fringe buckthorn-brown, mummy-brown between the vein-ends. Hind wing drab, the fringe slightly lighter. Under side of both wings and fringes light buff; both discocellulars ringed with mummy-brown; a postmedial fascia and some subterminal markings on both wings; the fringe of fore wing marked between the vein-ends with mummy-brown.

Expanse, ♂♂ 38–39 mm.

1 ♂ (holotype) and 1 ♂ (paratype), Mt. Elgon, July 1931 and December 1932 (*T. H. E. Jackson*).

May be placed near to *Dasychira extorta* Distant.

Dasychira semlikiensis, sp. n. (Pl. II. fig. 14.)

♂. Palpus and head clay-colour. Antennal shaft snuff-brown, pectinations Saccardo's-umber. Thorax tawny olive. Abdomen above and beneath, pectus, and legs tawny olive to pinkish buff. Fore wing cinnamon-brown; a broad pallid mouse-grey band running oblique inwardly from the costa at three-fourths to just below vein *Cu*2, the discocellulars, edged with Prout's-brown, slightly invading its proximal margin, and the crenate cinnamon-brown postmedial fascia running just inside its distal margin; some further pallid mouse-grey markings in the apical area; traces of a light subterminal fascia; a preterminal series of dark interneural spots; fringe bistre. Hind wing and fringe buffy brown. Under side of both wings drab; fringes snuff-brown; a dark shade in the cell of the fore wing; a postmedial fascia on the fore wing and postmedial and subterminal fasciæ on the hind wing, roughly parallel with the termen.

Expanse, ♂ 35 mm.

1 ♂ (holotype), Escarpment, West Semliki Valley, 20 miles south-west of Boga, 3500–4000 ft., borders of

tropical forest and long-grass country, July 1924 (*T. A. Barns*).

Resembles *Dasychira proletaria* Holland, but easily distinguished by the shorter antennæ and the much smaller light area on the fore wing.

Dasychira pelodes, sp. n. (Pl. II. fig. 13.)

♂. Palpus tilleul-buff, the third segment and the outer side of the second segment snuff-brown. Antennal shaft tawny mixed with tilleul-buff, pectinations tilleul-buff. Head, body, and legs tilleul-buff mixed with vinaceous-buff; bone-brown dorsal tufts on the basal segments of the abdomen; an admixture of tawny on the outer side of the fore leg. Fore wing vinaceous-buff; some tawny markings subbasally; an indistinct tawny antemedial fascia, broken at the veins; the ground-colour between subbasal and antemedial fasciæ rather darker than the remainder of the wing; a patch of tawny on the discocellulars, the distal margin bowed, concavity terminad; a tawny postmedial fascia, bowed, concavity terminad, from costa to vein *Cu*1, then bowed, concavity terminad, to the inner margin; traces of a tawny subterminal fascia, broken at the veins; fringe vinaceous-buff. Hind wing and fringe tilleul-buff. Under side of both wings whitish to tilleul-buff; costa of fore wing tawny olive, the same colour extending to the discocellulars, and a postmedial fascia which does not reach the inner margin; fringe of fore wing tawny olive, and of hind wing tilleul-buff.

♀. Resembles the ♂, but the upper side of hind wing irrorated with vinaceous-buff.

Expanse, ♂ 32 mm., ♀ 38 mm.

1 ♂ (holotype), Lolodorf, Cameroons, 1894–95 (*L. Conradt*); 1 ♀ (allotype), Bitje, Ja River, Cameroons, October, wet season (*G. L. Bates*).

Related to *Dasychira nigroplagata* Bethune-Baker.

Dasychira callista, sp. n. (Pl. II. fig. 6.)

♂. Palpus on upper side ochraceous-tawny, beneath Dresden-brown. Antennal shaft ochraceous-tawny, pectinations cinnamon-brown. Head and thorax Prout's-brown; posteriorly on the thorax a patch of ochraceous-tawny. Abdomen drab. Pectus and venter pinkish buff.

Tibia and tarsus of fore leg buckthorn-brown, femur Dresden-brown; middle legs missing in the type; hind leg cinnamon-buff. Fore wing army-brown, suffused with patches of tea-green, particularly below the cell and between the postmedial fascia and the termen; a conspicuous almost round patch of bone-brown subbasally near the inner margin, on a ground of ochraceous-tawny; a broad band of light buff mixed with warm buff, running oblique inwardly from the costa at two-thirds to well beyond the discocellulars; a bone-brown postmedial fascia, crenate, points on the veins, concavities terminad, running oblique inwardly from the costa at five-sixths to below vein *Cu*2, invading the light buff area above and below vein *R*5; a bone-brown preterminal fascia, edged proximally with light buff, roughly parallel with the termen, broken at the veins, the spots at the tornus larger; fringe army-brown, tipped with light buff, and with light buff at the vein-ends. Hind wing light buff mixed with Saccardo's-umber, the fringe lighter. Under side of fore wing light buff, shaded with Saccardo's-umber in and beyond the cell; an almost straight postmedial fascia, not reaching the termen; fringe as on upper side, the army-brown continued interneurally round the apex. Under side of hind wing and fringe light buff; traces of a postmedial fascia, and some interneural bone-brown patches at the apex, invading the fringe.

Expanse, ♂ 35 mm.

1 ♂ (holotype), Lolodorf, Cameroons, 1894–96 (*L. Conradt*).

Near to *Dasychira basigutta* Walker, but quite distinct.

Dasychira mniodes, sp. n. (Pl. II. fig. 3.)

♂. Palpus warm buff, on the outer side snuff-brown. Antennal shaft tea-green, pectinations clay-colour. Head and thorax biscay-green mixed with tawny olive. Abdomen tawny olive to cinnamon-buff, slightly tinged with biscay-green; dorsal tufts of sayal-brown on the basal segments. Pectus and abdomen cinnamon-buff, mixed on the legs with snuff-brown. Fore wing tea-green, irrorated over the whole wing with fuscous; traces of a dark edging to the discocellulars, and of a crenate postmedial fascia, points on the veins, bowed, convexity terminad, from costa to vein *Cu*2, thence inwardly oblique to the inner margin; costa very narrowly edged with pinkish buff; fringe fuscous, pinkish buff at the vein-ends. Hind wing warm buff, shaded in the terminal area with Dresden-brown; fringe warm buff mixed with Dresden-brown. Under side of both wings and fringes warm buff, shaded over the whole wing, excepting the costal and inner marginal areas, with fuscous.

♀. Resembles the ♂, but with hind wing and under side of both wings more heavily shaded with fuscous, and with costa of fore wing very narrowly edged with light pinkish cinnamon.

Expanse, ♂♂ 27–28 mm., ♀ 34 mm.

1 ♂ (holotype) and 1 ♂ (paratype), Njala, Sierra Leone, 17th February and 13th April, 1932 (*E. Hargreaves*); 1 ♀ (allotype), Warri, Nigeria, September 1897 (*Dr. Roth*).

Appears to be related to *Dasychira rubricosta* Hering, of which I have not seen a specimen.

Dasychira phæogramma, sp. n. (Pl. II. fig. 12.)

♂. Palpus, head, thorax, and abdomen, tawny olive, the outer side of the palpus darker, and with a slight admixture of deep lichen-green on the thorax. Antennal shaft tawny olive, pectinations snuff-brown. Pectus, venter, and legs light buff, the outer side of tibiæ and tarsi darker. Fore wing deep lichen-green mixed with Verona-brown; a buckthorn-brown antemedial fascia, not reaching the costa, strongly bowed outwardly between the anal vein and the inner margin; discocellulars edged with buckthorn-brown; a crenate buckthorn-brown postmedial fascia, points on the veins, concavities terminad, from the costa at three-fourths to the inner margin at three-fourths; traces of a dark preterminal fascia, broken at the veins; fringe Saccardo's-umber, lighter at the vein-ends. Hind wing and fringe cinnamon-buff. Under side of both wings light buff, with tawny olive postmedial fasciæ not reaching the inner margins; fringe of fore wing Saccardo's-umber and of hind wing light buff.

Expanse, ♂ 54 mm.

1 ♂ (holotype), Sekondi, Gold Coast.

Nearest to *Dasychira muscosa* Holland. Distinctive features are the buckthorn-brown colour of the fasciæ on the fore wing and the clear cinnamon-buff of the hind wing.

Dasychira exitela, sp. n. (Pl. II. fig. 4.)

♀. Palpus pinkish buff. Head, body, and legs pale pinkish buff to pinkish buff; Saccardo's-umber dorsal tufts on the basal segments of the abdomen. Fore wing pinkish buff slightly tinged with olive-buff, and very sparsely irrorated with snuff-brown, and indistinct subterminal fascia of snuff-brown, composed of interneural spots, apparently running from the apex, and directed oblique inwardly to the inner margin at two-thirds; fringe pinkish buff. Hind wing and fringe pinkish buff. Under side of both wings and fringes pinkish buff, rather lighter than the upper side.

Expanse, ♀ 51 mm.

1 ♀ (holotype), Valley of N. Rukuru, Karonga District, Nyasaland, 200–400 ft., 16th July, 1910 (*S. A. Neave*).

Has the appearance of a faded specimen, but this is probably not the case. The subterminal fascia on the fore wing is reminiscent of the genus *Lælia*.

Dasychira satelles, sp. n. (Pl. II. fig. 11.)

♀. Palpus cinnamon-buff, the third segment and the outer side of the second segment darker. Antennal shaft pinkish buff, irrorated with snuff-brown; pectinations snuff-brown. Head and thorax buckthorn-brown, mixed on the tegula with mummy-brown. Abdomen sayal-brown, with mummy-brown dorsal tufts on the basal segments. Pectus, venter, and legs pinkish buff to clay-colour, mixed on the legs with snuff-brown. Fore wing buckthorn-brown; some scattered fuscous-black irroration on the basal half of the wing; a triangular pinkish-buff patch, one side bounded by the costa, the other two sides meeting at the lower angle of the cell; a conspicuous fuscous-black postmedial fascia, commencing on the costa at three-fourths, curving outwardly to vein *M*1, roughly parallel with the costa to vein *Cu*2, thence curving outwardly to the inner margin; an irregular fuscous-black subterminal fascia; a fuscous-black preterminal fascia, broken at the veins; fringe buckthorn-brown mixed with fuscous, lighter at the vein-ends. Hind wing Saccardo's-umber, the fringe lighter. Under side of both wings and fringes tawny olive; dark postmedial and subterminal fasciæ, in the fore wing visible only in the apical area, in the hind wing running almost across the wing; a rather faint dark spot on the discocellulars of the hind wing.

Expanse, ♀♀ 37–41 mm.

1 ♀ (holotype), Bingerville, Ivory Coast, 14th–17th August, 1915 (*G. Melou*); 1 ♀ (paratype), Sakbayeme, Cameroons, 5th October, 1931 (*G. Schwab*); 1 ♀, Kiframbero, Uganda, 24th November (*C. Christy*); 1 ♀, Kitale, Kenya, 21st February, 1930 (*G. W. Jeffery*).

May be placed near to *Dasychira lunensis* Hampson.

Dasychira cardinalli, sp. n. (Pl. II. fig. 1.)

♀. Palpus, head, pectus, and venter pale pinkish buff mixed with Saccardo's-umber, second segment of palpus on outer side Saccardo's-umber. Antennal shaft pale pinkish buff irrorated with Saccardo's-umber, pectinations snuff-brown. Thorax Saccardo's-umber mixed with pale pinkish buff. Abdomen snuff-brown mixed with pale pinkish buff, laterally on the basal segments orange-buff. Legs pale pinkish buff mixed with Saccardo's-umber, the tibiæ and tarsi with patches of Saccardo's-umber on the outer side, the mid- and hind tarsi buckthorn-brown on the inner side. Fore wing snuff-brown mixed sparsely with pale pinkish buff; a double antemedial fascia, the proximal portion poorly defined, the distal portion prominent and almost straight, snuff-brown, running from the costa at two-fifths to the inner margin at one-half, meeting the latter at right angles; discocellulars lightly marked with snuff-brown; a snuff-brown postmedial fascia, not crenate, bowed (convexity terminad) from the costa to below vein *Cu*2, thence oblique outwardly to the anal vein; subterminal and preterminal snuff-brown fasciæ, crenate, points on the veins; fringe pinkish buff, snuff-brown between the vein-ends. Hind wing orange-buff, shading to tawny olive in the apical area and narrowly edged with snuff-brown along the termen, the veins marked subterminally with snuff-brown; fringe pinkish buff mixed with snuff-brown. Under side of both wings Saccardo's-umber mixed with pinkish buff; traces of a dark postmedial fascia on both wings ; interior of hind wing, and especially the inner margin, tinged with orange-buff ; fringes pinkish buff, marked with Saccardo's-umber between the vein-ends.

Expanse, ♀ 54 mm.

1 ♀ (holotype), Navaro, Gold Coast, 11.00 north, 1.30 west, March–April 1923 (*A. W. Cardinall*).

Related to *Dasychira sublutescens* Holland, in which both antemedial and postmedial fasciæ of the fore wing are crenate.

Dasychira hypochlora, sp. n. (Pl. II. fig. 7.)

♂. Palpus cinnamon-buff, on the outer side and at the tip Prout's-brown. Antennal shaft Hay's-russet, pectinations fuscous. Head, thorax, and abdomen Prout's-brown. Pectus, venter, and legs pinkish-buff, mixed on the legs with Mars-brown. Fore wing Prout's-brown ; a broad light stripe running below vein *Cu*2 from cell to tornus ; a dark patch postmedially, produced towards the termen at vein *M*1 ; a series of preterminal interneural mummy-brown streaks ; fringe Prout's-brown, lighter at the vein-ends. Hind wing and fringe Prout's-brown. Under side of fore wing Prout's-brown ; a prominent light buff stripe, occupying the whole of the distal two-thirds of the wing between vein *Cu*2 and the inner margin ; fringe Prout's-brown, lighter at the vein-ends. Under side of hind wing and fringe Prout's-brown, the fringe tipped with light buff.

Expanse, ♂♂ 33–35 mm.

1 ♂ (holotype), Lolodorf, Cameroons, 1894–95 (*L. Conradt*) ; 3 ♂♂, Bitje, Ja River, Cameroons, 2000 ft., October and November.

Related to *Dasychira diatoma* Hering.

Dasychira diatoma acerata, subsp. n. (Pl. II. fig. 16.)

♂. The fore wing is darker than in *Dasychira d. diatoma* Hering, the antemedial fascia more distinct, and the termen straight or slightly convex. There is no yellow area on the upper or under side of fore wing, while on the hind wing it is absent or very slightly indicated on the upper side and reduced almost to a spot on the under side.

Expanse, ♂♂ 37–41 mm.

1 ♂ (holotype) and 1 ♂ (paratype), Boukouni, near Macenta, 1750 ft., 11th May, 1926; 2 ♂♂ (paratypes), Massadou, near Macenta, French Guinea, 1600 ft., 13th–17th May, 1926; all taken at light (*C. L. Collenette*).

EXPLANATION OF PLATE II.

Fig. 1. *Dasychira cardinalli*, sp. n., type ♀.
Fig. 2. —— *kivuensis*, sp. n., type ♂.
Fig. 3. —— *mniodes*, sp. n., type ♂.
Fig. 4. —— *excitela*, sp. n., type ♀.
Fig. 5. —— *phaleroides*, sp. n., type ♀.
Fig. 6. —— *callista*, sp. n., type ♂.
Fig. 7. —— *hypochlora*, sp. n., type ♂.
Fig. 8. —— *omodepseta*, sp. n., type ♀.
Fig. 9. —— *gonophoroides*, sp. n., type ♂.
Fig. 10. —— *gonophora* Holland, paratype ♂.
Fig. 11. —— *satelles*, sp. n., type ♀.
Fig. 12. —— *phæogramma*, sp. n., type ♂.
Fig. 13. —— *pelodes*, sp. n., type ♂.
Fig. 14. —— *semlikiensis*, sp. n., type ♂.
Fig. 15. —— *elgonensis*, sp. n., type ♂.
Fig. 16. —— *diatoma acerata*, subsp. n., type ♂.
Fig. 17. —— *soyensis*, sp. n., type ♂.
Fig. 18. —— *eclipes*, sp. n., type ♂.

VII.—*Insecta and Araneæ collected in the Kangerdlugsuak Region of East Greenland by the British Expedition, 1935–36.*

By G. D. Hale Carpenter, D.M. (Hope Professor of Zoology (Entomology) in the University of Oxford), and Åke Holm (Uppsala Universitets Zoologiska Institution).

Foreword (G. D. H. C.).

The specimens discussed in this paper were collected by members of the expedition under Mr. L. R. Wager, F.R.G.S., who gave an account of it in 1937 (Geogr. Journ. xc. (5) pp. 393–415). They were presented by Mr. Wager to the Oxford University Museum on the understanding that the British Museum (Natural History) should have what it needed. My part has been only to supervise mounting, prepare the drafts of the labels, distribute the specimens for identification, and correlate the results.

Grateful acknowledgements are here made to the following experts, who have most kindly identified the specimens;—Benson, R. B.; Brown, J. M.; China, W. E.;

Collin, J. E.; Condé, O.; Edwards, F. W.; Laing, F.; Prout, L. B.; Richards, O. W.; Roman, A.; Stringer, H.; Tams, W. H. T.; Thienemann, A.; Thompson, G. B.

The Araneæ are described by Mr. Åke Holm in the second part of this paper; the single species of *Ixodoidea* has been discussed by Professor P. Schulze (Rostock) †; the Acarina, at the time of writing, are in the hands of Dr. Ivar Trägårdh of Stockholm, who, unfortunately, has been prevented by ill-health and stress of other work from sending his promised account in time for this paper which has already been long delayed on its behalf.

A single species of Gasteropod mollusc was identified by Mr. G. I. Crawford, of the British Museum (Natural History), as *Vitrina angelica* Mosch.

In order that frequent repetition may be avoided the localities from which the insects were received are listed below, and will subsequently be quoted by number only; they are all to be found on Wager's maps. Data are thus available for an ecological study of the collection.

The base was on Skaergaard peninsula, at the eastern side of the entrance to Kangerdlugsuak Fjord, about 12 miles north-east of the meeting of parallels 32° E. and 68° N.

List of Localities.

1. Base, sea-level.
2. ,, 50 feet elevation.
3. ,, 150 ,, ,,
4. ,, 200 ,, ,,
5. ,, 300 ,, ,,
6. ,, 50 feet west of.
7. ,, south of, sea-level.
8. ,, ,, ,, 300 feet elevation.
9. ,, east of, sea-level.
10. ,, ,, ,, 50 feet elevation.
11. ,, ,, ,, 100 ,, ,,
12. ,, ,, ,, 200 ,, ,,
13. ,, ,, ,, 300 ,, ,,
14. Kraemer's Isle, Kraemer's Bay on south, sea-level to 1000 feet.

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† P. Schulze, 1938, "Über die 'bipolare' Zecke *Ceratixodes uriæ* (White)=*putus* (Pick.-Cambr.)." Zoologischer Anzeiger, Bd. 123, Heft. 1/2, pp. 12–17.

15. Kraemer's Isle, Kraemer's Bay on south, *circa* 300 feet elevation.
16. Miki Fjord, north bank, 50 feet elevation.
17. ,, ,, east end of lake valley, sea-level.
18. Hutchinson glacier, 2500 feet elevation.
19. Citadel, 2000 feet.
20. South Syenite glacier, sea-level.
21. ,, ,, ,, 1500 feet elevation.
22. ,, ,, ,, 2000 ,, ,,
23. ,, ,, ,, 2500 ,, ,,
24. North Syenite glacier, foot of, sea-level.
25. Mudderbugt (Muddy Bay), sea-level.
26. Notch mountain, *circa* 12 miles west of, 3800 feet elevation.
27. Notch mountain, *circa* 17½ miles west of, 3000 feet elevation.
28. Calving glacier, west of, 5½ miles inland, 3000 feet elevation.
29. Summer journey inland, 30 miles from coast, 4500 feet elevation.
30. Summer journey inland, 48 miles from coast, 4300–4500 feet elevation.
31. Summer journey inland, 50 miles from coast, 4500–4600 feet elevation.
32. Summer journey inland, 60 miles from coast, 5000 feet elevation.
33. Summer journey inland, 65 miles from coast, 5100 feet elevation.
34. Summer journey inland, 70 miles from coast, 5300–5700 feet elevation.
35. Summer journey inland, 70 miles from coast, 6500 feet elevation.
36. Jacobson Fjord, N.W. of, Camp 11, 45 miles from coast, 4500 feet elevation.

PART I. (G. D. H. C.)

The following species appear to be new records for Greenland, and are subsequently marked by *.

Collembola: *Isotoma* (*Pseudisotoma*) *sensibilis* Tullb.
,, *Isotoma* (*Vergatopus*) *arborea* (L.) Ågrew.
Hymenoptera: *Ichneumon* sp.

The insects taken by the expedition are catalogued in order of arrangement according to Imm's 'Text-book of Entomology,' third edition, 1934. Unless otherwise stated there is one specimen for the locality and date given.

THYSANURA.

Several specimens were sent to Dr. J. Douglas Hood at Rochester University, New York, but he has, unfortunately, not found himself able either to return the specimens or to forward identifications.

COLLEMBOLA.

An account of the Collembola was included by J. M. Brown in his paper "On some Collembola from Iceland and Greenland" in 'Annals and Magazine of Natural History,' (10) xx. pp. 514–520 (1937). His arrangement is here followed, but only names and localities are given.

ARTHROPLEONA.

Hypogastruridæ.

Hypogastrura armata (Nic). **16,** 6. v. 36.

Isotoma* (*Pseudisotoma*) *sensibilis* Tullb. **14, 17. vi. 36.

Isotoma* (*Vergatopus*) *arborea* (L.) Ågrew. **14, 6. viii. 35.

HEMIPTERA.

HETEROPTERA.

Capsidæ.

Chlamydatus pulicarius (Fall). One first stage larva. **25,** 29. vi. 36.

HOMOPTERA.

Coccidæ.

Orthezia cataphracta Shaw. **7,** under stone, 17. v. 36 : **8,** under stone, 9. vi. 36 : **16,** 12. vi. 36.

ANOPLURA.

MALLOPHAGA.

Ricinus sp. Mr. G. B. Thompson wrote of this specimen:—"It unfortunately lacks any host data. The host was in all probability a small Passerine, as this genus is characteristic of that group of birds. As there is only a single specimen, a female, it would not be possible in the present state of the systematics of this group to give any further notes on it."

SIPHUNCULATA.

Pediculus humanus Linn. From head of Eskimo.

LEPIDOPTERA.

TINEOIDEA.

Plutellidæ.

Plutella dalella Stn. **1,** in hut, 7. x. 35 : **1,** in hut, 18. vii. 36 : **12,** 8. vi. 36.

PYRALOIDEA.

Pyraustidæ.

Pyrausta torvalis Möschl. **20,** 25. vi. 36 ; two others, 28. vi. 36 : **25,** 1. vii. 36 : **28,** 16. vii. 36 : **29,** 25. vii. 36 (*P. B. Chambers*): **32,** 30. vii. 36, four (*P. B. Chambers*).

PAPILIONOIDEA.

Nymphalidæ.

Brenthis chariclea arctica Zett. **1,** found dead, 21. viii. 35 ; another with left fore wing missing, found dead, 22. viii. 35 ; another crippled by ill-developed wings, found dead, 2. ix. 35 ; another, 9. ix. 35 ; eleven, 16. vii. 36: **30,** 5. viii. 36 (*P. B. Chambers*).

GEOMETROIDEA.

Geometridæ.

Entephria polata punctipes Curt., ♂ approaching ab. *brullei* Lef. **29,** 25. vii. 36 (*P. B. Chambers*).

Eupithecia gelidata Moschl. **2,** on rock, 1. vi. 36, two : **6,** 14. vi. 36 : **9,** 8. vi. 36 : **14,** 17. vi. 36, eleven : **20,** 26. vi. 36, two : **25,** 29. vi. 36 ; two others, 3. vii. 36.

NOCTUOIDEA.

Noctuidæ.

Eumichtis sommeri Led. **1,** 16. vii. 36 ; another, 6. viii. 36 : **11,** 15. vi. 36 : **18,** 10. vii. 36 : **19,** 12. vii. 36.

Anarta richardsoni richardsoni Curtis. **20,** 27. vi. 36 : **28,** 16. vii. 36 : **30,** 5. viii. 36 : **32,** 30. vii. 36 (*P. B. Chambers*) : **36,** 19. viii. 35.

Crymodes exulis Lef. **19,** 12. vii. 36.

COLEOPTERA.

DIVERSICORNIA.

Coccinellidæ.

Coccinella transversoguttata Feld. **20,** 27. vi. 36 : **21,** 28. vi. 36 : **23,** 28. vi. 36, pair *in copula.*

Byrrhidæ.

Byrrhus fasciatus Forst. **13,** 31. v. 36, under vegetation, two.

RHYNCHOPHORA.

Curculionidæ.

Otiorrhynchus arcticus F. **7,** under stones, two, 4. v. 36 ; another, 17. v. 36 ; another, 8. vi. 36 : **10,** 12. vi. 36 : **13,** under stones, 12. v. 36 ; another, 17. v. 36 : another, 24. v. 36 ; another, 29. v. 36 ; another, 12. vi. 36 : **16,** four, under stone, 12. vi. 36 : **21,** 28. vi. 36.

HYMENOPTERA.

SYMPHYTA.

Tenthredinidæ.

Amauronematus? form of *pallicercus* Htg. **22,**27. vi. 36, abundant.

The specimen, on the advice of Mr. R. B. Benson, was sent to Herr O. Condé, who is working on this group. He kindly replied that it is perhaps a form of *pallicercus*, but differs from typical Central European specimens in having its head narrower than the thorax, whereas in the latter the head is generally as broad or broader. The saw is about twice as broad as that of a Central European specimen ; specimens from Kamschatka and from Letland have the saw nearly equally broad, but the head is broader. Herr Condé wrote that this single specimen does not constitute by itself good enough material for a name ; if more specimens were found with similar characters of head and saw, and agreeing with it in being entirely black, with only the knee and inside of the tibia slightly brown, a subspecies might be established.

Pristiphora sp.

Herr Condé reported that the single specimen was probably an American species; it was sent to America for further examination, but has not been returned at the time of writing.

APOCRITA

ICHNEUMONOIDEA.

Ichneumonidæ.

ICHNEUMONINÆ.

[Notes by A. ROMAN.]

Ichneumon* sp. **22, 27. vi. 36, "abundant."

Dr. Roman wrote of this female specimen:—"This I expect is an American species, neither *aurivillii* mihi nor *discoensis* Fox, perhaps already described. It has the short-jointed, filiform antennæ of *aurivillii* with no white ring, the thorax and abdomen black with only the tegula very dark red, the middle area of the postpetiole is strongly punctured, the legs are red with black coxæ and trochanters, visibly slenderer than in *aurivillii*. The third tarsal joint I–III is elongated, the fourth III subelongated, scopula obsolete, dark. Wings smoky with yellow stigma. Length about 11 mm. If the species was abundant it is a pity only a single specimen was secured."

CRYPTINÆ.

Cryptus arcticus Schdte. **1,** 17. vii. 36, female.

"A common species on all the Greenland coast, not found in Europe."

Atractodes bicolor arcticus Holmg. **1,** 3. viii. 36, female.

"A melanistic form of the commonest European species, first reported from East Greenland by myself in 1934. The Stockholm Museum has a ♀ of a pale form of this species from North America (collector Belfrage)."

Pimplidea sodalis Rthe. **14,** 17. vi. 36, two males.

"A common species on all the Greenland coast. Occurs on almost all European mountains reaching above tree limit, but is not known from North America."

TRYPHONINÆ.

Stenomacrus cf. *nigricornis* Boh. **29,** 25. vii. 36 (*P. B. Chambers*), two males and a female: **30,** 5. viii. (*P. B. C.*), eight males.

"This is one of the many difficult species of Thomson's fifth section. The antennæ are long-jointed, *i. e.*, the basal flagellar joints of the female are not transverse or quadrate. The postannellus is distinctly shorter than the following joint in both sexes. Head subcubical, a little narrowed behind eyes in the male. Propodeum with a rather indistinct arca media. Postpetiolus of the female parallel-sided, a little longer than broad; of the male more elongate and narrowed towards the base, in both sexes glabrous like the second tergite which is almost shorter than the first. The apical half of the abdomen is strongly compressed in the female, depressed in the male; terebra almost straight with slender sheath, which is hardly shorter than the second tergite. Wings with a rather narrow yellow stigma emitting the radius well before the middle, parallel nervure originating in or a little below centre of transverse brachial nervure.

"The species is very like *S. nigricornis* Boh. from Spitsbergen, but the antennæ are slenderer, especially in the male."

OPHIONINÆ.

Angitia cf. *specularis* Thoms. **20,** 5. vii. 36, one female.

"This may be the female of my *Angitia* cf. *claripennis* Thoms. of 1933, though the legs are still darker. The four posterior femora are quite black, the hind tibiæ black and white with no red. The mesopleural speculum is small but shining, the propodeum short and steep with the *arca centralis* pointed anteriorly, open behind, emitting the costulæ behind the middle. Sheath of terebra about as long as tergites two and three. Stigma transparent pale brown. Length 6 mm.; forewing 4·5 mm."

Anilasta didyma frigida Lundb. **28,** 16. vii. 36, female: **32,** 30. vii. 36, male (*P. B. Chambers*).

"As already mentioned by me (1934, Ann. & Mag. Nat. Hist. (10) xiv. pp. 610–611) there seems to be no other difference from the common European *Anilasta didymator* Thunb. than the much darker coloration of *frigida*. The style of the markings is the same and the structure identical, so I think it correct to consider *frigida* as an arctic race of *didymator*. The present male has all femora red as in the typical form."

APOIDEA.

Apidæ.

Bombus hyperboreus Schön. **20,** 26. vi. 36, female.

Bombus arcticus K. **28,** 16. vii. 36, female.

Bombus arcticus var. *groenlandicus* Sm. **1,** 17. vii. 36, worker: **12,** 10. vi. 36, female.

DIPTERA.

NEMATOCERA.

Dr. F. W. Edwards wrote of this collection: "It includes only twelve species, most, if not all, of which have previously been taken in East Greenland."

Culicidæ.

Aëdes nigripes Zett. **20,** 26. vi. 36, eleven females, marked "Abundant."

Chironomidæ.

Diamesa bertrami Edw. **2,** ix. 35, male, on rock: **2,** x. 35, three males, on snow. "Called by Eskimos Snow-bunting food": **11,** 1. vi. 36, female, beside water.

Diamesa ursus Kieff. (?) **1,** xi. 35, female: **3,** 17. v. 36: **11,** 1. vi. 36, two females beside water: **14,** 17. vi. 36, female; **17,** 11. vi. 36, five females.

Diamesa bohemani (Goet.) Edw. Pupal cases and drowned adults found in sheltered pools of running water, Kangerdlugsuak, 29. viii. 35.

Diamesa aberrata Lbk. **2,** ix. 35, male, on rock: **11,** 1. vi. 36, seventeen females: **17,** 11. vi. 36, female; **25,** 29. vi., female.

The following account of pupal skins has been kindly written by Professor Thienemann:—

Herr Dr. F. W. Edwards übersandte mir 2 Proben, die von der British Expedition to E. Greenland 1935–36.

No. I—mit der Bezeichnung "1. viii. 36. Summer journey inland, circa 70 m. from coast, c. 5300–5700 ft. coll. P. B. Chambers" enthielt eine grosse Anzahl Puppenhäute, die sämtlich zu einer Art der *Diamesa*-Gruppe s. s., vielleicht *Syndiamesa* s. s. sp. gehörten. Ferner eine Larve der *Diamesa*-Gruppe s. s. (vielleicht *Syndiamesa*) und zwei, wohl zur Gattung *Metriocnemus* gehörende Orthocladiinen-larven.

No. II—"Found in sheltered pools off running water. Kangerdlugsuak, 29. viii. 35 (common)" enthielt als Imagines nach Dr. Edwards Bestimmung 4 *Diamesa*-Arten: *aberrata* Lundb., *bertrami* Edw., *bohemani* Goet, *ursus* Kieff.

Das reiche Material an Puppenhäuten, die z. T. noch die ausschlüpfenden Imagines enthielten und daher sicher bestimmt werden konnten, bestand ausschliesslich aus *einer* Art, nämlich, *D. aberrata* Lundb.

Die Puppen sind typische *Diamesa*-puppen s. s. (vergl. Zoolog. Anzeiger ciii. 1933, p. 11; Stett. Ent. Zeitg. xcv. 1934, p. 6) und zwar ganz ähnlich den Puppen von *D. insignipes* K., *prolongata* K., usw. Vorläufig lassen sich die verschiedenen Arten von *Diamesa* s. s. im Puppenstadium nicht unterscheiden.

Spaniotoma (*Orthocladius*) sp. **34,** 1. viii. 36, eleven females, together with pupal cases from which they were presumably bred (*P. B. Chambers*).

According to Edwards "This is very possibly *O. obscuripennis* Holmgr., the wings being very noticeably dark grey, but it is also possible, as I have suggested elsewhere, that *O. obscuripennis* is a *Heterotrissocladius*; a re-examination of the type is needed. In the absence of the male it is difficult to place this species precisely, but in most respects it resembles the species of Group A (*Chætocladius*), differing, however, from the British species of that group in the darker wings and longer terminal segment of the antennæ, which is about as long as the preceding four segments together and without long hairs; also in venation, *R* 2+3 ending only a short distance beyond the tip of *R* 1; and in the tibial spurs, that of the front tibia being extremely short and the longer spur of the hind tibia apparently without any tooth."

Spaniotoma (*Orthocladius*) *mixtus* Holmgr. (?). **9,** 14. vi. 36, two females on snow and rock: **24,** 30. vi. 36, male.

Edwards wrote: "The male agrees with specimens I recorded doubtfully as *O. mixtus* in 1935 [Ann. & Mag. Nat. Hist. (10) xv. pp. 472 & 538] from Bear Island and East Greenland. The form is doubtfully distinct from *O. grampiana* Edw. of Scotland, differing chiefly in having the tip of the antennæ somewhat swollen and *A.R.* only about 1·0 instead of 1·2."

Spaniotoma (*Smittia*) *extrema* Holmgr. **1,** 12. vi. 36, female, in *Loiseleuria procumbens*: **15,** 13. vi. 36, two males, near *Loiseleuria procumbens*.

Spaniotoma (*Smittia*) sp. indet. **16,** 12. vi. 36, three males, abundant.

Mycetophilidæ.

Sciara tridentata Ribs. ?. **26,** 11. vii. 36, female.

Sciara sp. indet. **32,** 30. vii. 36, female (*P. B. Chambers*).

Simuliidæ.

Simulium (*Prosimulium*) *ursinum* Edw. **1,** 10. ix. 35, female; also two females found in sheltered pools of running water, Kangerdlugsuak, 29. viii. 35.

BRACHYCERA.

Empididæ.

Rhamphomyia hirtula Zett. **16,** 12. vi. 36, three males and four females, abundant.

CYCLORRHAPHA.

ASCHIZA.

Syrphidæ.

Syrphus nigroventris Fluke. **19,** 12. vii. 36, female: **22,** 27. vi. 36, five males, abundant: **24,** 30. vi. 36, female: **27,** 10. vii. 36, female.

Syrphus sp. near *luniger* Mg. and *perplexus* Osb. **25,** 29. vi. 36, female.

Syrphus sp. near *tarsatus* Zett. **20,** 26. vi. 36, female, abundant.

Syrphus ? *nigropilosus* Curran. **20,** 28. vi. 36, female: **28,** 16. vii. 36, female.

ACALYPTRÆ.

Cordyluridæ.

Scatophaga lanata Ldbk. **11,** c. 1. vi. 36, two females: **14,** 17. vi. 36, female: **17,** 11. vi. 36, male: **20,** 5. vii. 36, male: **22,** 27. vi. 36, female, abundant.

Scatophaga furcata Say (= *squalida* Mg. = *varipes* Holmgr.). **1,** 17. vii. 36, two females; 20. vii., twenty-three males and two females, abundant; 4. viii., one male: **22,** 27. vi. 36, female.

Helomyzidæ.

Leria septentrionalis Coll. **1,** 17. vii. 36, three males, two females, common.

Anthomyidæ.

Pogonomyia sp. **16,** 12. vi. 36, female, abundant.

Limnophora (*Spilogona*) *arctica* Zett. **9,** 14. vi. 36, one male, one female: **28,** 16. vii. 36, female.

Limnophora ? *hyperborea* Boh. **16,** 12. vi. 36, female.

Pegomyia hæmorrhoa Zett. **1,** 18. xi. 35, male found dead on snow: **4,** 11. vi. 36, male: **11,** c. 1. vi. 36, male: **14,** 17. vi. 36, two males, one female: **16,** 10. vi. 36, two males: **26,** 11. vii. 36, female.

Acroptena frontata Zett. **1,** 19. ix. 35, male and female; 17. x. 35, male; 27. v. 36, female; 3. vi. 36, female: **9,** 14. vi. 36, female: **11,** c. 1. vi. 36, three females: **14,** 17. vi. 36, female: **16,** 10. vi. 36, female: **18,** 8. vii. 36, female: **22,** 27. vi. 36, two females, abundant.

Paregle radicum L. **1,** 17. vii. 36, female; 20. vii., thirteen females, abundant; 4. viii., female.

Egle sp. of *parva*-group. **14,** 17. vi. 36, two females: **20,** 26. vi. 36, female, abundant: **24,** 30. vi. 36, female.

Delia echinata Seguy. **9,** 14. vi. 36, one male, one female : **11,** 1. vi. 36, male : **28,** 14. vii. 36, female.

Tachinidæ.

Peleteria ænea Zett. **29,** 25. vii. 36, male (*P. B. Chambers*).

Peteina stylata B. B. **4,** 11. vi. 36, male : **9,** 14. vi. 36, male : **15,** 13. vi. 36, male : **16,** 10. vi. 36, female.

Phormia groenlandica Zett. **1,** 8. vii. 36, female ; 17. vii. 36, female.

Phormia atriceps Zett. **1,** 17. vii. 36, one male, one female ; 20. vii., female : **14,** 17. vi. 36, female : **22,** 27. vi. 36, female : **24,** 30. vi. 36, female.

Cynomyia mortuorum L. **1,** 16. vii. 36, two females ; 17. vii., three males, seven females : **20,** 5. vii. 36, female : **25,** 29. vi. 36, female : **28,** 16. vii. 36, female.

Calliphora uralensis Vill. **1,** 17. vii., female.

PART II.—ARANEÆ. By ÅKE HOLM.

The following species of spiders were collected by the English Expedition to East Greenland (1935–6) in Kangerdlugsuak, Knud Rasmussen Land: the collector was P. B. Chambers. The material having been preserved dry many specimens were in bad condition, but by making them soft in water and transferring them into 80 per cent. alcohol the determination has been possible.

Ten species are represented in the collection, and two of them have been recorded as new to Greenland and the Nearctic area, viz., *Caledonia evansii* (Cambr.) and *Tiso æstivus* (C. L. Koch) (Å. Holm, 1937, Arkiv för Zoologi, Stockholm, 29 B, 12, 1). These species and all other micryphantids in the collection are mainly Palæarctic. *Dictyna borealis* Cambr. and *Hahnia glacialis* Sör. are endemic to Greenland, and the only Lycosid, *Lycosa groenlandica* Thor., exclusively Nearctic.

List of the Species.

1. *Dictyna borealis* Cambr.

1 ♂, 1 ♀ ad., 1 juv. Under stone at 300 ft., east of base, 12. v. 36.

1 ♂, 3 ♀♀ ad., 2 juv. Under vegetation at 300 ft., east of base, 15. v. 36.

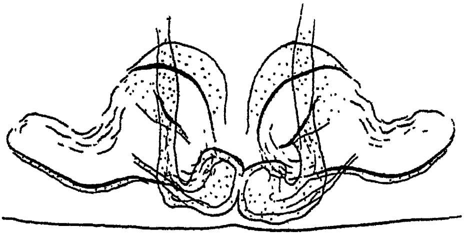
1 ♀ ad., 1. vii. 36.

1 ♀ ad., 1 juv. Under vegetation 60 m. from coast, 30. vii. 36.

1. juv. Under rocks and vegetation, 31. vii. 36.

An exclusively Greenland species. The male palpus is figured by Emerton (1919, p. 144, figs. 3–6 : *D. hamifera* Thor.) and the female epigyne recently by Jackson (1934 *a*, pl. xviii. fig. 2). I give a figure of the internal (and external) shape of the epigyne, which will characterize this species (fig. 1). The receptacula seminis are lying close together in the posterior part of the epigyne, and each receptaculum emits on its outer side a short duct, which runs forwards and opens into the middle of the broader, inner part of the oblong depression on each half of the epigyne. The posterior and antero-internal margins of these depressions are chitinized and sharp-edged.

Fig. 1.



Epigyne of *Dictyna borealis* Cambr.

This species is recorded from Greenland by Cambridge, 1877 (*D. b.*), Lenz, 1897 (*D. groenlandica*), Sörensen, 1898 (*D. hamifera* Thor.; ad. part), Emerton, 1919 (*D. hamifera* Thor.), Jackson, 1934 and 1938 (*D. b.*), and Braendegaard, 1935 and 1937 (*D. b.*).

Distribution.—West and East Greenland.

2. *Hahnia glacialis* Sör.

1 ♀ ad. Under stones, 200 ft., east of base, 28. v. 36.

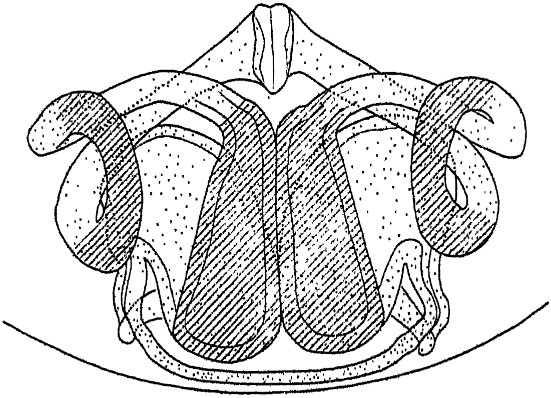
1 ♂ ad. Kraemer's Bay. On stones at 1000 ft., 17. vi. 36.

1 ♀ ad. Under stones, 300 ft., north-east of base.

Sörensen's description of *Hahnia glacialis* does not agree with the specimens in the present collection. In his description (Sörensen, 1898, p. 219) Sörensen states that the posterior row of eyes is strongly procurved, the interval between the posterior central eyes as long as the double eye diameter, and the area of the central eyes much longer than broad behind.

Dr. Kai Henriksen, Zoological Museum in Copenhagen, has kindly sent me a female specimen of Sörensen's types, and I am therefore able to state the complete identity of the specimens in the present collection and this species.

Fig. 2.



Epigyne of *Hahnia glacialis* Sör.

The posterior row of eyes is slightly procurved (the anterior tangent of the central eyes goes through the centre of the lateral eyes), the posterior central eyes are separated from each other by an interval only somewhat larger than their diameter, and the area of the central eyes is a little shorter than broad behind. The height of the clypeus is twice as great as the diameter of the anterior lateral eyes. The epigyne is of a very characteristic shape when cleared and examined transparently. The two long, winding ducts from the receptacula seminis have a common opening at the front of the epigyne: in all other species of *Hahnia* which I know this opening is at the hind part of the epigyne. The form of the receptacula and the convolution of the ducts is illustrated in fig. 2; the hatched parts are to be seen on the intact epigyne when immersed in alcohol.

Also Braendegaard, 1937, and Jackson, 1938, have recorded this species from Greenland.

Distribution.—West and East Greenland.

3. *Meioneta nigripes* (Sim.).

2 ♂♂ ad. Under stones at 300 ft., north-east of base, 29. v. 36.

2 ♀♀ ad. Under vegetation at 6500 ft., 2. vii. 36.

1 juv. Under vegetation, 13. vii. 36.

2 ♂♂ ad., 1 juv. Under vegetation on sedimentary ridge at 4500 ft., 25 miles from coast, north-east of base, 25. vii. 36.

1 juv. Under vegetation, 30. vii. 36.

3 juv. Under rocks and vegetation, 31. vii. 36.

1 ♂ ad. Coal corner. Under vegetation, 4. viii. 36.

3 ♂♂, 1 ♀ ad., 4 juv. Under vegetation, 5. viii. 36.

The specimens in the present collection resemble those which I have seen from the Swedish mountains. Even the young are easy to determine by means of the great posterior central eyes.

This species has previously been recorded from Greenland by Sörensen, 1898 (*Tmeticus levinsenii*), Jackson, 1934 (*M. n.*), and Braendegaard, 1937.

Distribution.—N. America, E. and W. Greenland, Jan Mayen, Spitsbergen, Iceland, Faroes, Scotland, Scandinavian mountains, French and Swiss Alps, Tyrol.

4. *Hilaira frigida* (Thor.).

1 ♀ ad. Under stones at sea-level, south of base, 17. v. 36.

1 ♂, 1 ♀ ad., 3 juv. Under stones at 400 ft., east of base, 2. vi. 36.

1 ♀ ad., 1 juv. Under rocks at 200 ft., east of base, 10. vi. 36.

1 juv. Kraemer's Bay. On stones at 3000 ft., 17. vi. 36.

1 juv. Under vegetation at 300 ft., east of base.

This species has been recorded from Greenland by Thorell, 1872 (*Erigone f.*), Sörensen, 1898 (*Tmeticus f.*), Jackson, 1930, 1934, and 1938 (*H. f.*), and Braendegaard, 1935 and 1937 (*H. f.*). The "*Erigone frigida* Thor." of Lenz, 1897, is *Hilaira vexatrix* (Cambr.).

Distribution.—West and East Greenland, Jan Mayen, Iceland, Faroes, Britain, and Scandinavia.

5. *Caledonia evansii* (Cambr.).

1 ♀ ad. Under stones at sea-level, south of base, 17. v. 36.

This species has newly been recorded from Greenland by Braendegaard, 1937. The only specimen corresponds very well with those from Swedish mountains.

Distribution.—East Greenland, Iceland, Britain, Sweden.

6. *Coryphæolana holmgreni* (Thor.).

1 ♀ ad., 2 juv. Under stones at 400 ft., east of base, 2. vi. 36.

1 juv. Under rocks at 200 ft., east of base, 10. vi. 36.

This species has been recorded from Greenland by Lenz, 1897 (*Erigone groenlandica*), Sörensen, 1898 (*Walckenaera similis*), Jackson, 1934 and 1938 (*Coryphæolanus h.*), and Braendegaard, 1937 (*C. h.*).

Distribution.—West and East Greenland, Jan Mayen, Spitsbergen, Bear Island, Iceland, Faroes, Scotland, Scandinavia, Novaya Semlya, Siberia.

7. *Erigone tirolensis* L. Koch.

1 ♀ ad. Under stones at 300 ft., north-east of base, 29. v. 36.

1 ♀ ad. 5½ miles inland, west side of Calving glacier, at 3000 ft., 16. vii. 36.

This species is recorded from Greenland by Braendegaard, 1935 and 1937 (*E. t.*), and Jackson, 1938 (*E. t.*).

Distribution.—North America, East Greenland, Jan Mayen, Spitsbergen, Iceland, Britain, Tyrol, Swiss Alps, Scandinavian Mountains, Novaya Semlya, and Siberia.

8. *Microerigone spetsbergensis* (Thor.).

1 ♀ ad. Under vegetation on sedimentary ridge at 4500 ft., 25 miles from coast, north-east of base, 25. vii. 36.

This species is recorded from Greenland by Thorell, 1872 (*Erigone s.*), Braendegaard, 1937, and Jackson, 1938.

Distribution.—Arctic America, West and East Greenland, Spitsbergen, Novaya Semlya, Siberia.

9. *Tiso æstivus* (L. Koch).

1 ♀ ad. Under stones at 200 ft., east of base, 28. v. 36.

1 ♀ ad. North bank, Miki Fjord. Under stones and vegetation, 10. vi. 36.

Recorded from Greenland by Braendegaard, 1937.

Distribution.—East Greenland, Iceland, Britain, Scandinavia, Tyrol, Tatra, Kamchatka.

10. *Lycosa groenlandica* Thor.

1 ♀ juv. Under rock at 300 ft., south of base, 12. v. 36.

1 ♂ juv. Under stone at sea-level, south of base, 17. v. 36.

1 juv. Under stone at 300 ft., east of base, 24. v. 36.

3 juv. Under stones at 300 ft., east of base, 24. v. 36.

1 ♂ juv. Under stone at 200 ft., east of base, 28. v. 36.

1 juv. Under stone at 200 ft., east of base, 28. v. 36.

1 juv. Under stone at 300 ft., north-east of base, 29. v. 36.

1 juv. Under stone at sea-level, south of base, 31. v. 36.

1 ♀ ad. with egg cocoon. Horseshoe Mts., at 3500 ft., 4. vi. 36.

1 juv. Under stone at sea-level, south of base, 8. vi. 36.

1 ♀ ad., 2 juv. North Bank, Miki Fjord. Under stones and vegetation, 10. vi. 36.

2 juv. Under stones at 50 ft., east of base, 12. vi. 36.

3 juv. Kraemer's Island. 60–300 ft., north of base, 13. vi. 36.

1 ♂ ad., 3 juv. On stones at 1000 ft., Kraemer's Bay, 17. vi. 36.

1 juv. Kraemer's Island, 19. vi. 36.

1 ♀ ad., 4 juv. On stones at 300 ft., Kraemer's Bay, 17. vi. 36.

1 ♀ ad. Ravens rock, 40 ft. up, 21. vi. 36.

1 ♂ ad., 3 juv. On rocks at 2000 ft., South Syenite glacier, 27. vi. 36.

1 ♂, 1 ♀ ad. 1 juv. 1. vii. 36.

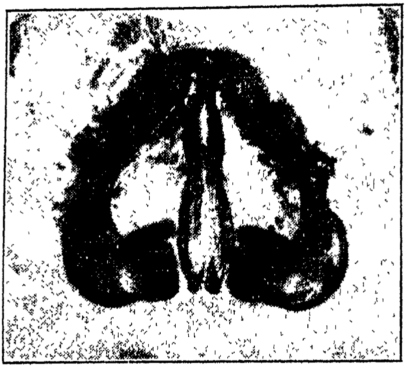
3 juv. On rocks at 1500 ft., 2. vii. 36.

1 juv. 3. vii. 36.

1 ♂ ad. On rock, 2000 ft., at Citadel, 13. vii. 36.

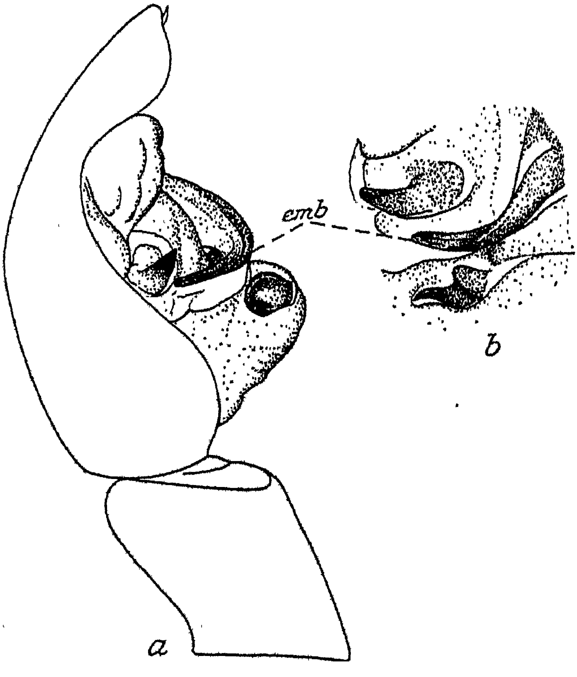
1 ♀ ad., 1 juv. 5½ miles inland, west side of Calving glacier, at 3000 ft., 16. vii. 36,

Fig. 3.



Epigyne of *Lycosa groenlandica* Thor.

Fig. 4.



a. Male palpus of *Lycosa groenlandica* Thor., external view.
b. Do., middle part of bulbus, ventral view.

4 juv. On stones (common), 30. vii. 36.

1 ♂, 2 ♀♀ juv. On stones, 30. vii. 36.

1 ♂ juv., 2 juv. 65 miles from coast, 5000–5500 ft., 31. vii. 36.

This species belongs to the same *Lycosa*-group as the European species *Lycosa atrata* Thor., *Lycosa lapponica* Thor., *Lycosa ferruginea* L. Koch, and *Lycosa septentrionalis* Westr. The epigyne of the female in this group has a deep heart- or bottle-shaped fovea, surrounded by a thick chitinized margin and divided by a longitudinal septum. Fig. 3 shows the epigyne of *Lycosa groenlandica.* I give also figures of the male palpus; in fig. 4 *a* the palpus is seen from the external side, and in fig. 4 *b* the middle part of the bulbus is shown from the ventral side. The bulbus has a long transverse embolus (fig. 4, *emb*) and two short apophyses, the one in the middle of the external side and the other in a little fovea of the basal part. In the males of the present collection the embolus is somewhat broader than in the figured specimen, which belongs to Thorell's collection.

Distribution.—Arctic America, West and East Greenland.

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VIII.—*Leeches* (*Hirudinea*) *from the Atlas Mountains of Morocco.* By J. PERCY MOORE.

INCLUDED in a miscellaneous lot of leeches sent for determination from the British Museum by Mr. C. C. A. Monro is a collection of fifteen tubes from the Moyen Atlas made by Mr. J. W. S. Pringle, of the Cambridge Freshwater Biological Expedition to Morocco in 1934. There is also a single tube from Lake Aguelman collected by Miss D. Aubertin. Although the collection is a small one, consisting of only five well-known species and one doubtful form, it is of interest for the new distributional data which it affords. I have no knowledge of any previous records of leeches from the immediate area covered by this collection. Besides a few scattered records of leeches from Egypt and the other Mediterranean countries of Africa Blanchard (1908) has reported from Tunisia: *Helobdella algira* (Moq.-Tan.), *Placobdella catenigera* (Moq.-Tan.), *Dina quadristriata* (Grube), *Limnatis* *nilotica* (Savigny), and *Hirudo troctina* Johnson; and Johansson (1914) from Algeria: *Hirudo troctina* Johnson, *Limnatis nilotica* (Savigny), *Limnatis oligodonta* Johansson, and *Dina lineata* (O. F. Müller). *Helobdella stagnalis* and *Hæmopis sanguisuga*, the two determined species of Pringle's collection not included in the lists of either Blanchard or Johansson, have both been reported from the Belgian Congo by Sciacchitano (1935). *Dina* sp. may prove to be new. Under each species only the original description and one other reference giving an extended synonymy are cited.

Although the collection was made in midsummer (July 16 to August 21), the condition of the reproductive organs indicates that the breeding season was already past. One *H. stagnalis* taken August 14 was with a brood of advanced young, and the young were already leaving three cocoons of *Dina lineata* collected on August 5. Except that many of the specimens were tightly rolled or strongly contracted most of the material was in good condition, but some had been dried.

Helobdella stagnalis (Linnæus).

Hirudo stagnalis Linnæus, 1758.
Helobdella stagnalis Autrum, 1936.

Four typical full-grown examples were taken at three stations. Two of these retain the characteristic nuchal plate; the other two have lost it in sloughing the cuticle. but the nuchal gland which secretes it is present in all. The young exhibit the gland, which secretes a viscid mucous, but no plate. One shows a delicate superficial reticular pigment pattern and a deeper pattern of reserve cells. Except for the black eyes and the light brown nuchal plate the others have lost all colour. The adult taken at Station E (no. 736) is accompanied by a number of detached young, nearly all of which have the proboscis protruded.

Sta. E, no. 736, Lake no. A, Ouiouane, 80 km. south-west of Azrou, 4500 ft., Aug. 14, adult and about twenty young; Spring no. 4, Ouiouane, 80 km. south-west from Azrou, 4500 ft., Aug. 16, one with three *Dina*; Lake Aguelman Aziza, 20 km. west of Oum er Rbia Springs, Aug. 21, 1934, two with seven small *Dina* sp. and three *Hirudo troctina*.

Hirudo troctina Johnson.

Hirudo troctina Johnson, 1816.
Hirudo troctina Blanchard, 1894.

This species is represented in the collection by mostly fairly well preserved specimens which range in size from 21×6 to 46×8 mm. The characteristic colour-pattern is retained, and agrees with Johansson's excellent description (1914).

There is, however, considerable variation in detail. The preserved ground-colour dorsally is generally bluish grey, varying in intensity and on some specimens slightly suffused with dusky or brown, ventrally some shade of yellowish or light orange. Most specimens have the three pairs of series of dorsal black spots on annulus *b* 2 or its equivalent of incomplete somites. Usually these are placed within larger orange or reddish spots, which often coalesce to form transverse bars on each side of *b* 2. As Johansson states, the spots of the intermediate series are largest and most constant, the paramedians the smallest and most inconstant, rarely present on every somite and occasionally almost or completely wanting. The orange spots or bars frequently remain after the corresponding black spots have disappeared. Some of the larger examples have delicate longitudinal black streaks connecting the dorsal spots, especially the intermediates. On the venter the submarginal black stripes are constant but vary in width, on some specimens being uniform in width, on others alternately wider and narrower, or they may be festooned, with the junctions of the loops on *b* 2, in which case they may extend into the orange marginal stripe to approach or even join the supramarginal black spots. Generally the remainder of the venter is more or less (on some specimens sparsely, on others rather plentifully) provided with irregular large or small separated black spots, but one specimen has the blotches numerous and large and coalesced into a coarse reticulum united with the submarginal stripes and giving a very dark effect. Three of the smallest have the ground-colour pale buff, lighter below where there are very few or no spots. Dorsally the paramedian spots are totally or nearly wanting, the supramarginals small and reduced in number, and the intermediates smaller than usual but very distinct and the series complete. The orange spots also are obsolete. Whether this condition is characteristic of the young or due to fading is a question.

On all examined for this feature the median ventral labial fissure is deep and continuous to the end of the prostomium as in *Limnatis.* The jaws of one mounted are perfectly smooth and without salivary papillæ; the teeth number 84, 84, and 72 (incomplete). Gastric cæca are as typical of the genus.

Reproductive organs of three dissected differ in no essential respect from those of *Hirudo medicinalis.* The slight differences in posture and proportions are due to differences in the degree of contraction and amount of blood in the cæca, and are no greater between the species than between individuals of the same species. Two have both atrium and vagina on the left side of the nerve-cord, the third has the atrium on the left the vagina on the right. Testes were dissected on only one, on which there are nine pairs at XIII./XIV. to XXII./XXIII.

Sta. B, Marshy, north-east shore, Lake Aguelman Sidi Ali, Moyen Atlas, 130 km. south of Meknes, July 19, four; Sta. 9, Lake Aguelman Sidi Ali, 130 km. south of Meknes, 6700 ft., July 25, two; no. 558, Timhadit, Guigou Riv., 40 km. south of Azrou, 6000 ft., August 8, one; no. 704, Lake C, Ouiouane, 80 km. south-west of Azrou, 4500 ft., Aug. 11, five with one *Limnatis nilotica*; Sta. D, no. 403, Oum er Rbia River, south-west of Azrou, Aug. 20, P.T.O., two light-coloured with much reduced spotting; Aguelman Aziza Lake, 20 km. west of Oum er Rbia Springs, Aug. 21, three with seven *Dina* sp. and two *Helobdella stagnalis*; Lake Aguelman, Atlas Mts., 7000 ft., April 10, 1935 (*Miss D. Aubertin*), two.

Limnatis nilotica (Savigny).

Bdella nilotica Savigny, 1820.
Limnatis nilotica Moquin-Tandon, 1826; Blanchard, 1894 (2).

A single young specimen of *Limnatis* undoubtedly belongs to this species, although no dissection was made to determine the characteristics of jaws, teeth, or other internal parts. Externally in form, colour, etc., it agrees exactly with Johansson's description (1914) of young examples from Algeria. In length, width, depth, and diameter of the sucker it measures 13·6, 3, 2·2, and 2·9 mm. The form is thick and clumsy, the anterior end broadly rounded, the posterior truncated by the large sucker, the greatest width far forward in the preclitellar region, from which it tapers very gradually caudad and more rapidly cephalad, depth nearly uniform. The lipis folded tightly into the large mouth, but the medial ventral furrow was determined to be deep and to extend to the prostomial margin. Eyes very distinct and typical in arrangement. The gonopores are fairly distinct, separated by five annuli, but there is no indication of the clitellum. The caudal sucker is very large, contracted and deeply cupped; if fully expanded it would exceed the maximum width of the body. Colour dorsally olive-brown, with traces of paramedian, intermediate, and supramarginal black stripes along which are a few small black spots, especially cephalad. Venter nearly the same colour but lighter and at the same time very finely mottled with dusky. Suckers both grey, and marginal stripes pale yellow.

Ouiouane (Lake C, no. 704), 80 km. south-west of Azrou, 4500 ft., Aug. 11, 1934 (*J. W. S. Pringle*), one young with *Hirudo troctina.*

Hæmopis sanguisuga (Linnæus).

Hirudo sanguisuga Linnæus, 1758.
Hæmopis sanguisuga (Linnæus), Harding.

The single specimen representing this species is full-grown but very hard and shrunken. Length 66 and width 12 mm. in the middle body, but the clitellum slightly greater. The postclitellar region is of nearly uniform width and flattened, the preclitellar narrower and subterete. The lip is contracted and folded into the large mouth, and the eyes are indistinguishable. Clitellum less contracted than other parts, so that it projects at the sides; it extends over fifteen annuli from X. *b* 5 to XIII. *a* 2. Male pore a large, open, lipped orifice at XI. *b* 5/*b* 6, the female a much smaller one at XII. *b* 5/*b* 6. Many nephropores show clearly on *b* 2. Anus very large, with raised rugous border. Caudal sucker small and contracted. Annulation sharply defined, each annulus rising into a sharp, somehwat crinkled transverse ridge, giving to the leech a serrate profile and outline. The constitution of the somites is as described by Harding (1910).

Colour above uniform nearly black, with no visible markings; ventrally dark brown finely mottled with dusky.

The jaws and velum are so shrunken that they are almost flush with the surface of the pharynx, but the distichodont teeth are conspicuous and number 15–18 pairs on each jaw. This is a new record for the region.

Aguelman Sidi Ali Lake (north side), 130 km. south of Meknes, 6700 ft., July 16, 1934 (*J. W. S. Pringle*).

Dina lineata (O. F. Müller).

Hirudo lineata O. F. Müller, 1774.
Dina lineata (O. F. Müller), Johansson, 1914.

The specimens of *Dina* fall into three groups. The first (*a*) consists of two lots of three large specimens (23×4 to 45×6 mm.), the second (*b*) of five lots of eighteen specimens of varied size (8×1 to 45×6 mm.), and the third (*c*) of one lot of seven small (8×1·4 to 15·2×2 mm.) specimens. All have the last annulus (*b* 6) of complete somites enlarged and subdivided. On groups *a* and *b* this is conspicuous and quite typical of Blanchard's genus *Dina*, but in group *c*, owing to poor preservation and the maceration of the hypodermis, this character was seen with difficulty in only a few places. By dissections of larger and entire mounts of small individuals it was determined for all three grouups that the cornual loops of the vasa deferentia extend forward to the level of ganglion X. as in *Erpobdella*, and are not turned sharply caudad at the level of the atrium as in certain American species hitherto referred to *Dina*.

On every specimen studied, and this included nearly all, the male pore was found at XI. *b* 2/*a* 2, and on all of groups *a* and *b* the female pore was two annuli further caudad at XI. *b* 5/*b* 6. On none of group *c* could the female pore be detected with certainty externally, but on stained and mounted specimens the junction of the paired ovisacs in a common vertical oviduct or vagina could be seen clearly so short a distance caudad of gan. XII. that the number of annuli between the two gonopores cannot be more than three, and more probably is two. The principal feature in which the groups differ is the eyes. In group *a* there are three pairs, one large labial and two smaller buccals as typical of *D. lineata* and figured by Johansson (1914). In group *b* there are four pairs, the buccals as in *a* and the labials two pairs of smaller eyes which on some individuals are very close together. These are like the typical *D. blaisei* Blanchard, which Johanssen unites with *D. lineata*. Blanchard (1893) figures many variations in the arrangement of the eyes, some of which were found in this material. The examples of group *c* typically have five pairs of eyes, presumably on somites II., III., and IV., although the annulation is undetermined. Of these there is one pair of large labials, occasionally two pairs of smaller ones, presumably on II., two pairs of somewhat smaller eyes on the sides of IV., and two pairs of yet smaller ones on the sides of III. All three specimens of group *a* have the ground-colour above brownish and marked with four punctated black longitudinal stripes, of which the paramedians are the denser, like typical *Dina lineata*, and resembling the American *Erpobdella punctata*. A few, especially of the larger individuals of group *b*, have the same pattern, less intensely developed. All of the small specimens of both groups *b* and *c* lack all obvious pigment except in the eyes.

My conclusion, therefore, is that the individuals of groups *a* and *b* are to be referred to *Dina lineata*, those of *a* being typical and those of *b* of the form of *D. blaisei* Blanchard. Those of group *c* may be an unusual variant of the same species, but more probably represent a hitherto undescribed species.

D. lineata, group *a*: Spring 3 C near Lake Aguelman Sidi Ali, Moyen Atlas, August 5, 1934, one large spec.; 2nd Spring, Guigou Riv., Moyen Atlas, Aug. 7, 1934; group *b*: Sta. 6, Lake Aguelman Sidi Ali, Moyen Atlas, 130 km. south of Meknes, 6700 ft., July 23, 1934, one; Sta. 11, same, July 28, six; Spring 2 A, near Lake Aguelman Sidi Ali, Aug. 5, 1934, four (the two larger of these, 34 mm. long, have the two pairs of labial eyes so close together that superficially they appear as one pair); Guigou Spring, Moyen Atlas, August 9, 1934, no. 572, three egg-cases and three free newly hatched young; Spring no. 4, Ouiouane, 80 km. south-west of Azrou, 4500 ft., three; Lake Aguelman, 7000 ft., Apr. 10, 1935 (*Miss D. Aubertin*), six, with *H. troctina*. The last are determined with some uncertainty as the tube was received broken and the specimens completely dried, but they have the slender form, small caudal sucker, prominent ♂ pore separated from the ♀ by two annuli, and the subdivided *b* 6 of this species.

Dina sp. ?

The specimens referred to under *Dina lineata* as constituting group *c* are unfortunately all small and poorly preserved, with the hypodermis largely desquamated. Those best preserved have the eyes arranged as described above, others have the head distorted and the eyes somewhat disarranged. In all other respects, so far as determined, they resemble young *Dina lineata*. The disposition of the eyes on II., III., and IV. approximates the conditions figured for *Hylacobdella* by Sciacchitano, but members of that genus are described as having the gonopores separated by five annuli. In the present form they are only two or possibly three annuli apart.

Lake Aguelman Aziza, 20 km. west of Oum er Rbia Springs, August 21, 1934, seven small with *H. stagnalis* and *H. troctina*.

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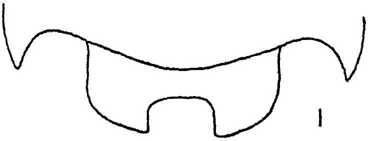
IX.—*New and little-known Bees of the Subfamily* Anthidiinæ (*Apoidea*).—Part I. By G. A. MAVROMOUSTAKIS, Limassol, Cyprus.

THE Anthidiine bees described and recorded below were loaned by the British Museum through the kindness of Mr. Robert B. Benson, and by Professor V. Gussakovskij, Zoological Institute, Leningrad, from his private collection. The following abbreviations are used in this part :—B.M. = British Museum ; coll. Guss. = collection Gussakovskij ; coll. m. = my collection.

Anthidium undulatiforme Friese. (Fig. 1.)

Male.—Length 14 mm. (end of abdomen bent).

Black ; clypeus shining, slightly convex, densely punctured, with a median longitudinal, polished and impunctate line from base to apex, lower margin straight and bluntly angular at sides ; occiput punctured and shining ; vertex densely punctured ; clypeus, lateral face-marks reaching level insertion of antennæ, creamy white ; lower margin of clypeus narrowly yellow except the reddish-brown narrow sides ; mandibles yellow, tridentate, teeth black except the reddish-brown base of the larger apical one ; occiput with broad yellow stripe slightly interrupted in the middle ; all face below median ocellus with white hairs (the hairs on clypeus sparse and short) ; vertex and occiput with short pale yellowish-brown hairs. Thorax black ; mesonotum very densely punctured and moderately shining ; scutellum narrow, convex, strongly and very densely punctured, apical margin slightly depressed in the middle ; between the apex of mesonotum and the base of scutellum a somewhat deep transverse depression ; area of metathorax dull, minutely and very densely punctured, and regularly punctured at sides ; scutellum with narrow apical yellow stripe on each side ; mesonotum with a yellow stripe on each side, broader above and reaching axillæ ; tubercles yellow ; tegulæ yellow and yellowish brown in the middle ; wings clouded ; second recurrent nervure interstitial with second transverse cubital nervure ; thorax with very pale yellowish-brown hairs above and white hairs at sides ; femora black, apex very broadly yellow ; apex of femora with a short spine-like tubercle on each side beneath ; tibiæ yellow above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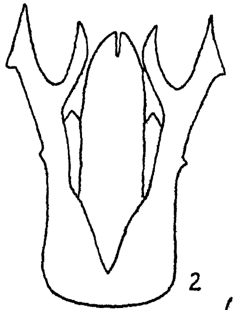
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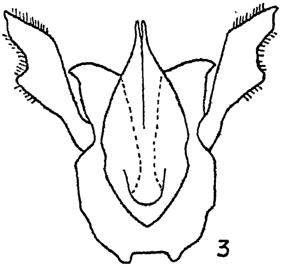
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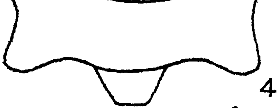
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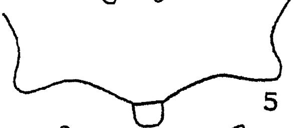
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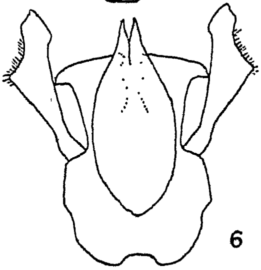
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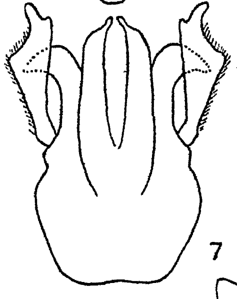
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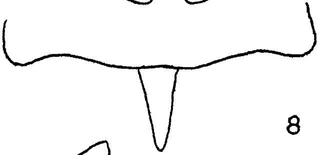
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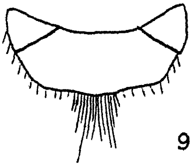
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Fig. 1.—Sixth and seventh abdominal tergites of *Anthidium undulatiforme* Friese, ♂.

Fig. 2.—Genitalia of *Paraanthidium ovatum* (Cameron).

Fig. 3.—Genitalia of *Archianthidium laticeps* (F. Mor.), ♂.

Fig. 4.—Sixth and seventh abdominal tergites of *Archianthidium laticeps* (F. Mor.), ♂.

Fig. 5.—Sixth and seventh abdominal tergites of *Archianthidium atlanticum ibericolum*, subsp. n., ♂.

Fig. 6.—Genitalia of *Archianthidium atlanticum ibericolum*, subsp. n.

Fig. 7.—Genitalia of *Archianthidium pubescens* (F. Mor.), ♂.

Fig. 8.—Sixth and seventh abdominal tergites of *Archianthidium baluchistanicum*, sp. n., ♂.

Fig. 9.—Scutellum of *Proanthidium venustum* (F. Mor.), ♀ (drawn by V. B. Popov from the type).

and black beneath except the yellow apex ; spurs yellowish brown ; pulvilli absent. Abdomen black and moderately shining ; first and second tergites very sparsely and shallowly punctured, sides strongly punctured, subapical area somewhat minutely punctured ; first tergite with broad yellow mark nearly covering sides ; tergites 2 to 6 with similar but longer lateral yellow stripes not reaching the middle ; sixth tergite with somewhat long lateral spine, apical margin slightly and bluntly produced in the middle ; seventh tergite black, with two broad yellow lobes, and between the lobes a deep rounded incision ; sides of tergites with white hairs ; tergites with sparse pale golden bristles ; sixth sternite nearly heart-like, punctured, with polished and impunctate, longitudinal and shallow furrow in the middle, sides slightly elevated.

ARMENIA : Jnaklu, 4000 ft., 1 ♂, 18. vii. 1924, in coll. Guss.

This large species has a superficial resemblance to *Proanthidium oblongatum* (Latr.) or *Proanthidium trochantericum* (F. Mor.), but it is larger, with the venation, scutellum, last abdominal tergites, and colour sufficiently different.

PARAANTHIDIUM Friese. (Fig. 2.)

The writer, in Ann. & Mag. Nat. Hist. (10) xix. p. 155 (1937), published the opinion that the genera *Protanthidium* and *Paraanthidium* were probably identical. On examining the genitalia of *Protanthidium ovatum* (Cameron), from Borneo (fig. 2), I found that the genera *Protanthidium* and *Paraanthidium* are identical, the latter having priority. The members of *Paraanthidium* have the tubercles slightly erect in front, as in the Nearctic genus *Paranthidium*, the mandibles of the female broad, with four or five short and blunt teeth.

Paraanthidium steloides (Bingham).

INDIA : Sikkim, 1 ♂ (*Staudinger*), in m. coll.

Sixth tergite produced and emarginate in the middle ; seventh tergite hidden below the sixth. The genitalia have the stipes large, with two branches (the anterior branch pointed in the apex) and covering the sagittæ. *Paraanthidium steloides* is related to *Paraanthidium muiri* Mavrom., from China.

ARCHIANTHIDIUM, gen. nov. (Fig. 3.)

Mandibles of the female broad as in *Paraanthidium*, with four short and blunt teeth or with one apical and two smaller subapical teeth, and a basal blunt corner; pulvilli present; second recurrent nervure enclosed very closely to the end of second cubital cell, nearly as in the genus *Megachile*; clypeus broader than long; scutellum normal, without projection, tubercles small, disk slightly convex and not erect in front. Maxillary palpi 4-jointed; first joint very small and somewhat broad; second joint thick, longer than first; third and fourth joints small, third longer than fourth; labial palpi 4-jointed; second joint slightly longer than first; third and fourth joints very small; first joint of labial palpi with some short hairs from base to middle. Sagittæ ovate and pointed above; stipes large and peculiar, somewhat longer than sagittæ, and with some hairs above; volsellæ broad and flat (fig. 3).

Genotype: *Anthidium laticeps* F. Mor. (lectotype).

This interesting genus is related to *Berna* (Zool. Jahrb. xxx. pp. 668–669, 1911) from the Ethiopian region, but according to Professor Bischoff, who has kindly examined the type at my request, *Berna africana* Friese has no pulvilli and it belongs to *Megachile*. *Archianthidium* differs from the Nearctic genus *Heteranthidium*, as the latter has the maxillary palpi 3-jointed, the tubercles erect in front, and the venation that of *Anthidium* (s. st.).

Archianthidium laticeps, subsp. *anatolicum*, nov. (Fig. 4.)

Male.—Length 16 mm.

Differs from the typical race as follows:—The pale yellow lateral face-marks reaching top of eyes; a yellow mark above each eye; cheeks with entire yellow stripe reaching base of mandibles; axillæ marked with yellow; mesonotum with a L-shaped yellow stripe on each side above; first abdominal tergite with very large lateral yellow mark, and with two central yellow spots; second and third tergites with broad yellow stripes, somewhat attenuated in the middle.

SYRIA: Amanus, 1 ♂ (type), 1899, in m. coll. (received by Professor Friese).

Archianthidium atlanticum, subsp. *ibericolum*, nov. (Figs. 5 & 6.)

Male.—Length 12·5 mm.

Black; clypeus broader than long, shallowly and somewhat sparsely punctured and shining, ochreous; lateral face-marks (filling space between clypeus and supraclypeal area and eyes) surpassing level insertion of antennæ, ochreous; a basal ochreous narrow stripe on supraclypeal area; a bright yellow mark above each eye; antennæ black, scape yellow beneath; mandibles yellow, apex black-brown. Thorax entirely black; tegulæ brown, finely punctured; second recurrent nervure enclosed near the end of second cubital cell; femora black-brown, apex narrowly yellowish, anterior and middle ones with yellow stripe beneath; pulvilli present; spurs yellow; seventh tergite with the apical margin produced in the middle as in *Archianthidium laticeps*, but rounded (fig. 5); genitalia related to those of *Archianthidium laticeps*, but are different (fig. 6).

Spain: Humeva, 1 ♂ (type), in m. coll.; Arena, S. Pedro, 1 ♂ (paratype), vi. 1928 (*Dusmet*); Aragon, Albarracin, 1 ♂ (paratype), 1–8. vii. 1928 (*Zerny*), in Vienna Museum.

Differs from the typical race from Morocco (Benoist, in Bull. Soc. Ent. France, x. p. 160, 1934) in the entirely black thorax. Mr. R. Benoist has kindly written me about his type of *Anthidium atlanticum* as follows:—"Le thorax est noir avec une ligne jaune élargie en avant, longitudinal de chaque côté du mesonotum; axillæ en majeure partie jaunes, lobe médian du scutellum avec 2 taches jaunes (1 de chaque côté)."

Archianthidium pubescens (F. Mor.). (Fig. 7.)

Balkan: Kaluckova, 1 ♂, in m. coll.

Archianthidium pubescens maximum (Friese).

Syria: Taurus, 1 ♂, in m. coll. (received through the kindness of Friese).

Archianthidium forcipatum (F. Mor.).

Tadzhikistan: Hissar Mountains, Rujdasht, 10,000 ft., 1 ♂, 22. vii. 1927 (*V. Gussakovskij*), in m. coll.

Archianthidium baluchistanicum, sp. n. (Fig. 8.)

Female.—Length 14 mm.

Black ; clypeus yellow, finely punctured, pentangular, lower margin slightly emarginate in the middle and black-brown ; mandibles yellow, apex black and with an apical large blunt tooth, two blunt smaller subapical, and an edentate and blunt base ; lateral face-marks (filling space between clypeus and eyes and nearly reaching top of eyes), cheeks except very narrowly the base on outer side all yellow ; the occipital broad and short yellow stripe not reaching the cheeks, but a little extending on vertex and triangularly notched in the middle beneath ; antennæ black ; scape reddish brown in front ; supraclypeal area, front, vertex, and occiput with dull yellowish-brown hairs ; cheeks with shining white hairs ; clypeus with short and sparse yellowish-brown hairs ; sides of face up to insertion of antennæ with shining white hairs, rest with dull yellowish-brown hairs. Thorax black ; mesonotum very densely punctured and moderately shining, with somewhat dense dull yellowish-brown hairs ; scutellum narrow, nearly yellow, with denser and longer dull yellowish-brown hairs ; sides of thorax with shining white hairs ; axillæ with large yellow mark ; mesonotum with a L-shaped yellow stripe, slightly interrupted and attenuated at sides above ; tubercles black ; second recurrent nervure enclosed in the end of second cubital cell ; femora yellow, with black narrow stripe beneath ; tibiæ yellow, and nearly black-brown beneath and on outer side ; tarsi yellow ; hind basitarsi flat and broad, base broader than apex, with dense and short yellowish-brown hairs on inner side ; tibiæ above and tarsi on outer side with sparse and short light yellowish-brown hairs ; spurs yellowish. Abdomen black ; tergites sparsely and very finely punctured, apical margins broadly densely and very finely punctured ; apical margin of third tergite slightly and convexly produced in the middle ; first and second tergites with broad and long lateral yellow stripes nearly reaching the middle ; third and fourth tergites with transverse yellow median stripe slightly notched above, apical margin of fourth broadly emarginate in the middle ; fifth tergite yellow, apical margin black and broadly emarginate in the middle ; sixth tergite short and entire, with large lateral marks nearly reaching the middle; first abdominal tergite with lateral white hairs, rest with very short dull yellow-white hairs, apical margin with black-brown hairs in the middle; second tergite with very short and nearly sparse dull yellow-white hairs, those on the apical margin black-brown except sides; rest of tergites with short dull yellow-white hairs, those on sixth dense and shorter; scape covered with pollen, but light yellowish white.

Male.—Length 14·5 mm.

Similar to the *female*; mandibles large as in *Archianthidium forcipatum*, with an apical tooth and a smaller subapical; scape with yellow stripe in front; lower margin of clypeus with some very small rounded tubercles. Thorax black; mesonotum with dense and somewhat short dull yellowish-brown hairs above; scutellum with similar but longer hairs; thorax with white hairs at sides; mesonotum with very narrow yellow stripe at sides along the base of tegulæ; anterior femora black, apex broadly above and a stripe beneath yellow; middle femora black, with a stripe beneath and a stripe above nearly reaching the base yellow; hind femora yellow above, black with short basal stripe beneath; anterior tibiæ yellow above, light reddish brown on inner side, black-brown beneath and on outer side except the reddish-brown apex; middle tibiæ yellow above and black beneath and on outer side except narrowly the apex; hind tibiæ yellow above and black-brown beneath; tarsi yellow, apex of claws black; pulvilli present; anterior basitarsi sufficiently shorter than tibiæ; middle basitarsi very long, as long as tibiæ and very narrow; third tergite with broadly interrupted yellow stripe; fourth and fifth tergites with broad transverse yellow stripe slightly notched in the middle above; sixth tergite yellow, broadly interrupted in the middle, apical margin black (brown at sides), with rounded sides as in *Archianthidium forcipatum*; seventh tergite short and produced in the middle into a long entire spine, brown in the base and black in the apex (fig. 8).

BALUCHISTAN: Chitan Forest, 7000 ft., 1 ♀ (type), 1 ♂ (allotype), 14. v. 1931 (*D. Harrison*), in B.M.

This species differs from *Archianthidium forcipatum* in the different colour and the form of the seventh tergite of the male, and from the related *Anthidium edentatum*

Friese, ♀, in the different colour of the head, thorax, tubercles, and abdominal tergites. As regards his type of *Anthidium edentatum* Professor Friese has written me as follows:—"Scutellum black; axillæ black, with a small yellow mark; tubercles half yellow; apical margin of third tergite entire; thorax without hairs above." The yellow colour on abdomen in the type and allotype of *Archianthidium baluchistanicum*, sp. n., changed by cyanide.

PROANTHIDIUM Friese.

Mandibles long and multidentate, apex of teeth with sharp point; pulvilli absent; second recurrent nervure out of second transverse cubital nervure; clypeus broader than long; scutellum projected, subdentate at sides or rounded at sides; tubercles slightly erect in front; maxillary palpi 2-jointed; first and second joints small, second joint somewhat longer than first. Sagittæ present and covering spatha; stipes long and hairy; volsellæ small.

Genotype: *Anthidium oblongatum* Latr. (lectotype).

Commenting on the African Anthidiinæ (Rev. Zool. Bot. Afr. xix. 1, pp. 44–45, 1930), Cockerell stated:—"Friese 1898 proposed a subgenus *Proanthidium* consisting of a mixture of diverse insects, but later I designated *Anthidium oblongatum* Latr. as the type (Ent. Rec. iii. (12) pp. 269–270, 1909). *Anthidium oblongatum* has no pulvilli, it has the second recurrent nervure going beyond the second cubital cell and the scutellum is subdentate at each side."

Of the three goups included by Friese in his subgenus *Proanthidium* only the first group is really a member of *Proanthidium* (group of *Anthidium oblongatum*).

Proanthidium undulatum subsp. *holozonicum*, nov.

Male.—Length 8 mm.

Scape black-brown, base and apex reddish brown or with reddish-brown stripe in front; occiput with entire yellow stripe broadly descending on cheeks and not reaching base of mandibles (in the typical race with a small yellow mark above each eye); first abdominal tergite with entire ochreous lemon-yellow stripe (in typical race with a lateral yellow mark reaching the middle);

tergites 2 to 5 with basal half transversely ochreous lemon-yellow (in typical race second and third tergites with a yellow band nearly entire, narrow, and anteriorly notched); seventh tergite entirely ochreous lemon-yellow (in typical race black, with lateral yellow mark).

Female.—Length 8 mm.

Similar to the male; mandibles tridentate, between the median and apical with 5 or 6 very small denticles; sixth tergite ochreous lemon-yellow, apical margin narrowly black; ventral scopa shining white, light yellowish brown from middle to apex.

CYPRUS: Limassol, 1 ♀ (type), 1 ♂ (allotype), 29. vi. 1930; 1 ♀ (paratype), 30. vi. 1931, 1 ♂ (paratype), 9. 7. 1931 (*G. A. Mavromoustakis*).

Proanthidium venustum (F. Mor.). (Fig. 9.)

Mr. V. B. Popov has kindly examined the type of *Anthidium venustum* Mor. (Zoological Institute, Leningrad) at my request. He wrote me as follows:—"Apical margin of the scutellum entire and with long hairs in the middle (fig. 9); second recurrent nervure is out of second transverse cubital nervure; the legs without pulvilli." *Proanthidium venustum* differs from the related *Proanthidium undulatum* Dours in the form of the scutellum, which in the latter is emarginate in the middle and without the brush of long hairs. Pérez, in Bull. Soc. Am. Sc. Nat. Rouen, p. 7, 1911, published the opinion that *Anthidium venustum* F. Mor. (*morawitzi* D.T.), ♀, and *Anthidium undulatum* Dours, ♀, were identical, and based his opinion on material collected by Kadeau de Kerville from Syria (Brumana and Beit-Méri). This is not correct, however, because the above Syrian specimens have the apical margin of the scutellum emarginate in the middle, and belong to a variety of *Anthidium undulatum* Dours, probably to *holozonicum* Mavrom. My opinion confirmed Mr. R. Benoist, who has examined the Syrian specimens of *Proanthidium oblongatum* in Paris Museum. Mr. Benoist wrote me as follows:—"La collection Pérez contient seulement deux exemplaires de l'*Anthidium undulatum*. Le premier exemplaire est une femelle prise par Gadeau de Kerville à Brumana; outre l'étiquette de localité, elle porte de la main de J. Pérez une autre étiquette portant *morawitzi*

D.T.=*undulatum* ♀. La ♀ Brumana a le scutellum légèrement émarginé au milieu. Le second exemplaire est un mâle pris par Gadeau de Kerville à Beit-Méri. Le ♂ de Beit-Méri avec un taille un peu supérieure (10 mm.) est construit comme l'*Anthidium undulatum holozonicum* que vous m'avez envoyé autre fois et sa coloration est la même."

Dalla Torre renamed *Anthidium venustum* F. Mor. to *Anthidium morawitzi* D.T. because Cresson had described with the same name a Nearctic species of *Anthidium*. But according to Cockerell and Schwarz *Anthidium venustum* Cresson is a member of *Dianthidium*.

Proanthidium trochantericum (F. Mor.).

ALEXANDER MOUNTAINS, 1 ♂, 17. vii. 1930 (*L. Bianchi*). WEST PAMIR, 1 ♂, 1. ix. 1936 (*A. Ivanov*), in coll. Guss. and in m. coll.

X.—*A Contribution to the Study of the* Dytiscidæ.—I. (*Coleoptera, Adephaga*).

By J. BALFOUR-BROWNE, M.A., F.Z.S., F.R.E.S., British Museum (Natural History).

NOTERINÆ.

Notomicrus tenellus (Clark).

Hydroporus tenellus Clark, 1863, Trans. Ent. Soc. Lond. (3) i. p. 427 (Java).

Hydroporus politus MacLeay, 1871, Trans. Ent. Soc. N.S. Wales, ii. p. 124 (Queensland).

Notomicrus lævigatus Sharp, 1882, Trans. Roy. Dublin Soc. (2) ii. p. 260 (Queensland).

Notomicrus suturalis Sharp, 1882, *loc. cit.* p. 261 (Queensland).

? *Notomicrus punctulatus* Fauvel, 1903, Rev. d'Ent. xxii. p. 245 (New Caledonia).

The above synonymy is established on the types of Clark and Sharp in the British Museum collections and on three specimens from Dalby, Queensland, labelled "*Hydroporus politus* MacL., Id. by A. M. Lea, compd. ty." I have seen specimens in the British Museum from Luzon, Philippine Islands, and Singapore, Straits Settlements, considerably extending the known distribution of this very small species. In view of its distribution from Malaya and the Philippine Islands, Java, New Guinea, and Queensland to Samoa, I am convinced that the *N. punctulatus* Fauvel from New Caledonia is conspecific with *N. tenellus* (Clark), particularly since, in all the specimens I have seen, there is a fine reticulation which appears alutaceous, under a high magnification, as described by Fauvel.

Notomicrus sharpi, nom. nov.

Notomicrus politus Sharp, 1882, Biol. Centr.-Amer. i. (2) p. 3 (non MacLeay).

The *Hydroporus politus* MacLeay having been proved to be a *Notomicrus*, it is necessary to change the name of Sharp's species from Guatemala, and I propose for it the name *sharpi*.

Canthydrus marshalli, sp. n.

Ovalis, sat elongatus, postice attenuatus, in medio sat convexus, supra indistincte reticulatus, niger, nitidissimus, iridescens; capite et pronoto rufo-flavis, hoc ad discum maculâ nigra triangulare ornato; elytris ad basin extus maculâ oblongâ atque pone medium versus latera maculâ geminatâ, flavis ornatis, apicis rufo-piceis; subtus piceo-flavus, antennis pedibusque sordide rufo-flavis.
Long. 2·73 mm.; lat. 1·45 mm.

Natal, Eastcourt, Feb. 1893; type (unique) (*G. A. K. Marshall*). In the British Museum.

This species resembles *C. koppi* Wehn. in the colour-pattern of the elytra, but is smaller, rather more convex, more attenuate posteriorly, without the black vertex of the head, and with a triangular black mark on the disc of the pronotum. It is possibly an extreme variety of *C. minutus* Rég., the only species I know which has the postmedian elytral spot geminate; but the form is more attenuate and less convex, and it should be regarded as a valid species.

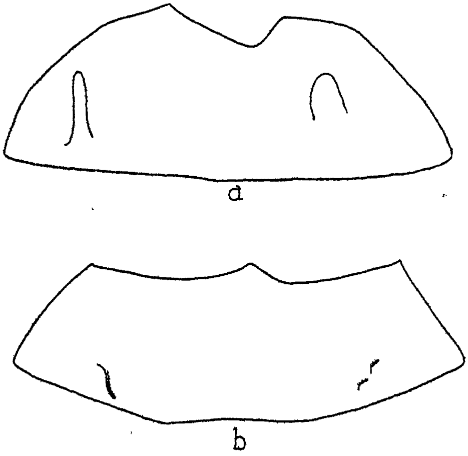
Canthydrus natalensis, sp. n.

Ovalis, minus elongatus, modice convexus, postice leviter attenuatus, niger, nitidissimus, iridescens; capite et pronoto rufo-flavis, hoc in medio ad basin maculâ nigrâ ornato; elytris utrinque pone medium versus latera maculâ flavâ rotundatâ parvâ ornatis; subtus niger vel rufo-niger, antennis pedibusque rufo-flavis.
Long. 2·54–2·68 mm.; lat. 1·36–1·45 mm.

South Africa, "Port Natal," type and 5 co-types; "Natal," 2 co-types. In the British Museum.

This species comes very close to *C. morulus* O.-C., of which it may be no more than a southern form, but the point of greatest convexity lies somewhat further forward, the form is rather shorter, the sinuosity of the lateral edge of the elytra is less marked, so that the shoulder seems not quite so produced, the prosternal process is more heavily and closely punctured and the elytra show no trace of the other flavous spots seen in *C. morulus* (of which I have a long series from Uganda), nor is the vertex of the head at all infuscate. The base of the pronotum is similarly marked with black, and the two species are obviously closely related by the form of the prosternal process, which is rather narrow and transversely weakly convex between the procoxæ.

Fig. 1.



Apical ventral segment (sixth sternum) of the male.
(a) *Laccophilus seminiger* Fauvel; (b) *Laccophilus walkeri*, sp. n.

LACCOPHILINÆ.

Laccophilus seminiger Fauvel.

Laccophilus seminiger Fauvel, 1883, Rev. d'Ent. ii. p. 337.

A single male specimen from Adelaide River, Arnhemland, Australia, coll. J. J. Walker, in the British

Museum, is undoubtedly of this species, hitherto known only as a unique from New Caledonia. This specimen is also a male, and shows the structures of the sixth sternum described by Fauvel as "lamellâ subobliquâ erectâ utrinque armatâ" (fig. 1, *a*), that of the left side being set obliquely and erected obliquely, but that of the right side is set much more transversely and not erected, but lies adpressed to the sternum, the posterior margin of which is asymmetrically emarginate in the middle.

By the form of the ædeagus (fig. 2, *a*) the species is evidently related to *L. sharpi* Rég. (fig. 2, *c*), which was placed by Sharp in the seventh group of the genus, whereas Fauvel places *L. seminiger* in group 6, but the distinction between groups 6 and 7 being only one of colour is of no fundamental importance, and the relationship of the two species is therefore undisturbed.

Laccophilus walkeri, sp. n.

Ovalis, sat latus, sat depressus, nitidus; capite et pronoto flavo-testaceis, hoc ad basin in medio maculis duabus parvis nigris; elytris nigro-brunneis, vittâ transversâ postbasali plus minusve interruptâ et suturam et humeros attingente, maculâ laterali in medio longitudinis, vittâ transversâ anteapicali multâ majore interruptâ, maculâ parvâ subapicali, et lineis sublongitudinalibus in tota superficie irregularibus et confusis, flavo-testaceis. Subtus sordide rufus, antennis flavis, pedibus rufo-testaceies.

Long. 4·18–4·39 mm.; lat. 2·23–2·37 mm.

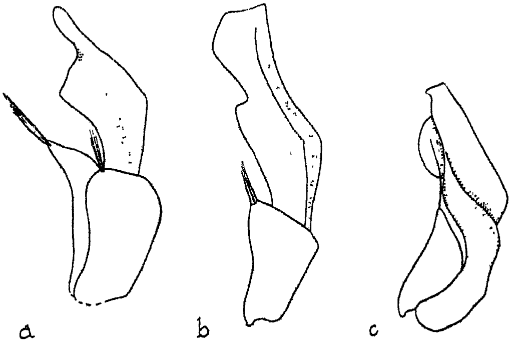
Australia, Arnhemland, Adelaide River; holotype ♂, allotype ♀, 1 ♂, 2 ♀♀ paratypes (*J. J. Walker* leg.). In the British Museum.

This new species superficially resembles *L. sharpi* Rég., but is much more shining, the reticulation, which is double, is only very lightly impressed, the larger areoles only distinguishable in slightly oblique view; the elytral irrorations are much more confused, not very conspicuously linear, appearing rather as a "marbled" pattern; the subbasal band is slightly oblique, rather interrupted, but clearly visible from shoulder to shoulder, the anteapical band is very inconspicuous, much invaded by the irrorations, much more so than in *L. sharpi*.

This species also belongs to the *L. sharpi* group by the form of the ædeagus (fig. 2, *b*). The apical ventral segment of the male (fig. 1, *b*) is slightly asymmetrical along the posterior edge, the centre produced into a short point; at the base on the left side an oblique ridge, slightly elevated, with a shallow excavation at the base internally; on the right side are two small ridges set in line obliquely but barely projecting. These structures are evidently homologous with the erect "laminæ" of *L. seminiger*, but there is no trace of homologous structures in *L. sharpi*, although by the form of the ædeagus these three species form a sharply defined group distinct from all other species known to me.

I have great pleasure in naming this species after the collector, Commander J. J. Walker, R.N.

Fig. 2.



Ædeagus (dorsal view).
(a) *Laccophilus seminiger* Fauvel; (b) *Laccophilus walkeri*, sp. n.; (c) *Laccophilus sharpi* Régimbart.

Laccophilus lucasseni Régimbart.

Laccophilus lucasseni Régimbart, 1892, Notes Leyden Mus. xv. p. 106: 1899, Ann. Soc. ent. Fr. lxviii. p. 265 (variety).

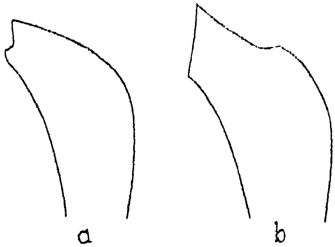
Two males, one from Soë and one from Baguia, Timor, appear to belong to this species, which I have not otherwise seen. They answer tolerably well to the description, particularly of the specimen from Timor mentioned in the second reference, in that the black basal and apical marks of the pronotum are not very strongly coloured. I am indebted to Prof. Dr. Handschin of the Schweizerische Naturhistorische Museum, Basel, for these specimens, one of which is in the British Museum collection, the other in the Basel Museum.

Laccophilus clarki Sharp.

Laccophilus clarki Sharp, 1882, Trans. Roy. Dublin Soc. (2) ii. p. 313.
Laccophilus sharpi var. *clarki* Fauvel, 1883, Rev. d'Ent. ii. p. 337.

Examination of this species suggested that Sharp had correctly placed this species as valid, and dissection of ♂♂ of the type series confirms that Sharp was right. The species actually, on the form of the ædeagus (fig. 3, *b*), has no relationship with *L. sharpi*, but is evidently very close to *L. parvulus* Aubé (fig. 3, *a*), from which species it is, in fact, not easy to separate it on external characters. The anterior tarsi of *L. parvulus* are rather more robust and shorter and broader than in *L. clarki*, and the produced portion of the sixth sternum is not quite so large in *L. parvulus* as in *L. clarki*. This latter species generally has the pronotum with a black mark in the middle of the anterior and posterior margins, but this is occasionally feebly developed or absent.

Fig. 3.



Apex of the ædeagus.
(a) *Laccophilus parvulus* Aubé; (b) *Laccophilus clarki* Sharp.

I have seen no specimens of either of these two species from New Guinea. Zimmermann states, I do not know on what authority, that *L. parvulus* var. *decoratus* Boheman occurs there. All Australian specimens in the British Museum from Queensland (Gayndah and Rockhampton) and Arnhemland (Port Darwin and Adelaide River) belong to *L. clarki* Sharp.

I have seen no specimens of *L. parvulus* from any locality in the Melanesian subregion of Australasia, and doubt its occurrence there.

I take this opportunity of stating the following synonymy from Sharp's types:—

LACCOPHILUS PARVULUS Aubé, 1838, in Dejean, Spec. Col. vi. p. 429.
Laccophilus obtusus Sharp, 1882, Trans. Roy. Dublin Soc. (2) ii. p. 311.
Laccophilus derasus Sharp, 1882, *loc. cit.* p. 311.
Laccophilus dispersus Sharp, 1882, *loc. cit.* p. 312.

LACCOPHILUS FLEXUOSUS Aubé, 1838, *loc. cit.* p. 430.
Laccophilus solutus Sharp, 1882, *loc. cit.* p. 315.
Laccophilus cognatus Sharp, 1882, *loc. cit.* p. 316.
Laccophilus chloroticus Régimbart, 1887, Notes Leyden Mus. ix. p. 267.

LACCOPORUS, gen. nov.

Corpus elongato-ovale, sat depressum; pronoto in medio ad basin angulariter producto, scutello tecto; processu prosternali longe producto, lanceolato, longitudinaliter carinato, tenuiter marginato; mesosterno tecto; apophysibus metacoxarum postice spatuliformibus; femoribus tibiisque pedum anteriorum intermediorumque et tibiis posticis et supra et subtus densissime punctatis, articulis tribus basalibus tarsorum posteriorum subtus dense punctatis; calcaribus tibiarum posteriorum simplicibus, acutis; segmentibus tarsorum posteriorum extus minime lobatis.

Genotype: *Laccoporus viator*, sp. n.

This new genus comes next before *Philaccolus* Guignot in the Laccophilinæ. Guignot characterized *Philaccolus*, (i.) by the sublanceolate prosternal process, (ii.) by the straight base of the pronotum, (iii.) by the slightly transverse areoles of the dorsal reticulation, and (iv.) by the acutely pointed metatibial spurs. The last of these characters is found in a number of genera of the Laccophilinæ, and serves to separate *Laccophilus*, with bifurcated metatibial spurs, from *Laccodytes*, *Philaccolus*, *Laccophilus* (*Philodytes*) (subg. nov.) *, and *Neptosternus*. *Laccoporus* thus belongs to the second group.

Laccoporus differs from *Philaccolus* by the elongate, fully lanceolate prosternal process which is slightly carinated longitudinally, by the broad, angularly produced basal margin of the pronotum, and by the irregular reticulation. It differs from *Philodytes* by the much

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* This subgenus is described in Journ. Linn. Soc. Lond. 1938 (in press).

longer, more carinated prosternal process, and by the dense puncturation of the femora and tibiæ of the anterior and intermediate legs and of the metatibiæ and underside of the basal three segments of the metatarsus.

Laccoporus viator, sp. n.

Elongato-ovalis, sat depressus, supra flavicans vel flavopiceus, immaculatus, omnino reticulatus, areolis irregularibus; subtus niger, segmentibus tribus posterioribus abdominis postice plus minusve late rufo-flavis, antennis pedibusque rufo-flavis.

Long. 4·79–5·18 mm.; lat. 2·54–2·81 mm.

Tibet: Gyangtse, 13,000 ft., June 1904; holotype ♂, allotype ♀, 4 ♂♂, 6 ♀♀ paratypes. (Tibet Expedition, *H. T. Walton* coll.) In the British Museum.

This new species appears to be sufficiently characterized by the short diagnosis. It superficially resembles *Laccophilus difficilis* Sharp, but may at once be recognized by the more elongate form and the black under surface.

Table of Genera of the Laccophilinæ.

1.	Base of thorax straight or not angularly produced in the middle; elytral sculpture transverse, even if weakly so	2.
1′.	Base of pronotum angularly produced in the middle; elytral sculpture irregular .	3.
2.	Prosternal process trifid; posterior pronotal angles produced................	*Neptosternus* Sharp.
2′.	Prosternal process sublanceolate; posterior pronotal angles not produced	*Philaccolus* Guignot.
(*a*)	Metatarsal segments weakly lobed on the outside (subgenus)	*Philaccolus* (s. str.).
(*b*)	Metatarsal segments strongly lobed on the outside (subgenus)	*Philaccolilus* Guignot.
3.	Prosternal process triangular or oval; metasternal processes not divergent, truncate	*Laccodytes* Régimbart.
3′.	Prosternal process lanceolate or sublanceolate; metasternal processes divergent, spatuliform	4.
4.	Prosternal process lanceolate; pro- and mesofemora and tibiæ and metatibiæ densely punctate above and below	*Laccoporus*, gen. nov.
4′.	Prosternal process lanceolate or sublanceolate; pro- and mesofemora and tibiæ and metatibiæ not densely punctate either above or below	5.
5.	Metatibial spurs bifid at apex	*Laccophilus* (s. str.) Leach.
5′.	Metatibial spurs acute at apex. (Subgenotype: *Laccophilus umbrinus* Motschulsky)	*Laccophilus* (*Philodytes*), subg. nov.

COLYMBETINÆ.

Copelatus hæmorrhoidalis (Fabricius).

Dytiscus hæmorrhoidalis Fabricius, 1787, Mant. Ins., i. p. 192.
Dytiscus ruficollis Schaller, 1783, Schrift. Nat. Ges. Halle, i. p. 313.
Dytiscus schalleri Gmelin, 1790, in Linnæus, Syst. Nat. i. (4), p. 1952.
Dytiscus agilis Fabricius, 1792, Ent. Syst. i. p. 194.
Dyticus oblongus Illiger, 1802, Mag. Ins. i. p. 72.
Colymbetes oblongus Stephens, 1828, Ill. Brit. Ent. Mand. ii. p. 65.
Agabus oblongus Erichson, 1832, Gen. Dytisc. p. 38.
Rantus (*Liopterus*) *oblongus* Lacordaire, 1835, in Boisd. & Lac., Fn. Ent. Paris, i. p. 310.
Agabus (*Liopterus*) *oblongus* Aubé, 1836, in Dejean, Icon. Col. v. p. 132, pl. xvi. fig. 2.
Agabus agilis Erichson, 1837, Käf. Mark. Brand. i. p. 163.
Copelatus (*Liopterus*) *ruficollis* Bedel, 1881, Fn. Col. Bass. Seine, i. p. 242.
Copelatus agilis Fowler, 1887, Col. Brit. Isl. i. p. 200.
Copelatus (*Liopterus*) *agilis* F. Balfour-Browne, 1938, Syst. Notes Brit. Aq. Col. i. p. 63.

There is much confusion in the literature as to the name of this species, and the name which has valid priority has for some reason been quite overlooked. Schaller's name, the first in date, being a homonym of *Dytiscus ruficollis* Degeer (1774) * (which is an *Haliplus*), must be suppressed. What is generally overlooked is that two names have date priority to *Dytiscus agilis*, and Erichson † has stated that he had seen the Fabrician types of *D. hæmorrhoidalis* and *D. agilis* and that they were conspecific. Through the kindness of Dr. Olaw Schröder, of the Zoologisches Museum der Universität, Kiel, I have seen the holotype of *D. hæmorrhoidalis*, which is a female, 7·75×3·67 mm., in a quite good state of preservation, and I can confirm Erichson's statement. There is therefore no doubt but that the valid name of the northern and western European species is *Copelatus hæmorrhoidalis* (Fab.).

The holotype is peculiar in that the disc of the elytra is deeply infuscate, but there is no other distinction from the normal form.

Copelatus aruensis, nom. nov.

Copelatus hæmorrhoidalis Régimbart, 1883, Notes Leyden Mus. v. p. 229 (non Fabricius).

As has been shown above the *Dytiscus hæmorrhoidalis* Fabricius is a *Copelatus*, and the species named by Régimbart requires a new name.

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* Degeer, 1774, Mém. Hist. Ins. iv. p. 404, pl. xvi. fig. 9.
† Erichson, 1837, Käf. Mk. Brand. i. p. 164.

As far as I am aware the species still rests on the unique specimen from the Aru Islands, and since many of the Australasian species of this genus are local to island groups I propose for it the new name *aruensis*.

Genus AGABUS (s. l.) Leach.

RANAGABUS, subgen. nov.

Corpus elongatum, sat parallelum, convexum; pronoto ad latera leviter curvato, distincte marginato, apicibus elytrorum extus fortiter rotundatis; processu prosternali lanceolato, tenuiter marginato, ad basin carinato, versus apicem tectiforme; alis metasternalibus acute triangulatis; pedibus longis, angulis postero-internis femorum posteriorum productis; segmentibus tribus basalibus tarsorum anteriorum intermediorumque maris subtus pubescentibus; segmento primo metatarsorum subtus sine series lineares punctorum.

Subgenotype: *Agabus* (*Ranagabus*) *kermanensis*, sp. n.

The long narrow form of this species suggests *Agabus* (*Nebrioagabus*) *discicollis* Ancey, but the almost transverse pronotum, with the base barely narrower than the elytra, the sides distinctly and fairly strongly margined, the long narrow prosternal process, and the basal metatarsal segment without any series of spiculiferous punctures immediately separates it.

This subgenus also differs, in the form of the prosternum and the absence of any series of spiculiferous punctures on the basal metatarsal segment, from *Agabinectes* Guignot.

I am loth to create a new subgenus for this remarkable species, but the following characters, taken together, separate the species so sharply from all the groups of Sharp that I consider the only course to follow is the creation of a special subgenus :—(i.) Lanceolate prosternal process; (ii.) narrowly triangular metasternal wings; (iii.) strongly margined pronotum; (iv.) internal posterior angles of the metafemora strongly produced, laminar, shielding the base of their tibiæ when the leg is contracted. Of these characters I attach the greatest importance to (i.) and (iv.). As will be seen below, in a discussion on *Agabus flohrianus* Sharp, I consider that the character of the spiculiferous punctures on the inner side of the basal metatarsal segment is open to serious objection as to its phylogenetic significance, and consequently, although I have mentioned this character in the diagnosis of *A. kermanensis* as not being present, I do not attach importance to it as a feature of the new subgenus.

Agabus (*Ranagabus*) *kermanensis*, sp. n.

Elongatus, sat parallelus, convexus, niger, nitidus; capite antice obscure rufo; pronoto fere transverso, angulis posticis rectis, ad latera distincte marginato, fusco-rufo; elytris nigris; subtus fusco-rufus, segmento ultimo abdominis maris fere truncato, in medio immarginato, utrinque leviter longitudinaliter rugoso, in medio lævigato, feminæ regulariter curvato, tenuiter marginato; antennis pedibusque rufo-testaceis, his posticis infuscatis; unguiculis tarsorum anteriorum maris, præcipue interno, quam in femina magis rectis et robustis.

Long. 12·0–13·0 mm.; lat. 6·0–6·25 mm.

Iran: Kerman, holotype ♂, allotype ♀; Baft, July 1923, 1 ♂, 1 ♀ paratypes; Och Bala, Yezd, 2. viii. 1935, 9000 m., 2 ♂♂ paratypes (all *H. E. J. Biggs* leg.). In the British Museum; 1 ♂ paratype from Och Bala in coll. H. E. J. Biggs.

This new species is very distinct from any known to me by the large size, almost transverse pronotum with the posterior angles rectangular, the produced hind angle of the metafemora, and the sexual dimorphism of the apical ventral segment.

The reticulation of the whole dorsal surface is very lightly impressed, the areoles are small, as in *Agabus flohrianus* Sharp, and irregular in shape.

Agabus (*Necticus*) *flohrianus* Sharp.

Agabus flohrianus Sharp, 1887, Biol. Centr.-Amer. i. (2) Suppl. p. 756 (ex parte).

Gaurodytes flohri Zimmermann, 1917 (1919), Arch Naturg. lxxxiii. p. 207.

Agabus (*Agabinectes*) *flohrianus* Guignot, 1938, Miss. de l'Omo, iv., Zool. p. 48, footnote 2.

I have little doubt that the species indicated by Zimmermann is this species.

Guignot refers this species, with *A. rectus* (Lec.) and *A. amaroides* Sharp, to the subgenus *Agabinectes*, of which the subgenotype is *A. brunneus* (Fab.). I am unable to support the inclusion in one subgenus of such diverse types, and regard the phylogenetic significance of the row of spiculiferous punctures of the basal metatarsal segment as very doubtful.

In my opinion the purpose of classification in subgenera is to bring together those species of a genus which are most closely related and presumably having common ancestry. To suggest that the presence of the row of spiculiferous punctures in *A. brunneus* and *A. flohrianus*, species as diverse in form and ecology as any in the genus, indicates common ancestry is, I think, insupportable. If this character were taken by itself it would, perhaps, provide a reasonable basis, but since it is admittedly present in other species of the genus which possess different supporting characters, and are therefore excluded from *Agabinectes*, it cannot be regarded as a suitable character on which to base subgeneric distinctions in *Agabus*.

F. Balfour-Browne (1935) * has already given reasons for the suppression of *Agabinectes* which have not, to my mind, been conclusively destroyed by Guignot (1936) †, and in view of the results of using this character I have no hesitation in insisting that the subgenus should be suppressed; the species will therefore revert to the subgenus *Necticus* Hope.

Agabus (*Necticus*) *amaroides* Sharp.

Agabus amaroides Sharp, 1882, Biol. Centr.-Amer. i. (2) p. 33.
Agabus flohrianus Sharp, 1887, *loc. cit.* (ex parte).
Agabus (*Agabinectes*) *amaroides* Guignot, 1938, *loc. cit.* p. 48, footnote 2.

The same arguments apply here as for the last species, and it must revert to the subgenus *Necticus* Hope.

A series of four specimens, 1 ♂ and 3 ♀♀, from Amecameca, Mexico, collected by Höge, is included by Sharp in the type series of *A. flohrianus*. It appears to have escaped his notice that the inner protarsal claw of the male of *A. flohrianus* is simple, whereas, as he correctly states, it is dentate beneath in *A. amaroides*.

The male specimen from Amecameca has the dentate inner protarsal claw, and the pronotal form of the females is obviously broader behind as described for *A. amaroides*. These specimens are therefore of the latter species.

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* F. Balfour-Browne, 1935, Ent. Mon. Mag. lxxi. p. 8.
† Guignot, 1936, Bull. Soc. ent. Fr. xli. p. 188.

Rantus suturalis (MacLeay).

Colymbetes suturalis MacLeay, 1825, Annul. Jav. ed. 1, p. 135.
Colymbetes pulverosus Stephens, 1828, Ill. Brit. Ent. Mand. ii. p. 69, pl. xii. fig. 2.
Rantus notatus Boisduval, 1835, in Boisd. & Lac., Fn. Ent. Paris, i. p. 311.
Colymbetes rufimanus White, 1846, Voy. 'Erebus' & 'Terror,' Zool. ix. p. 6.
Colymbetes montrouzieri Lucas, 1860, Ann. Soc. ent. Fr. (3) viii. p. 243.
Rhantus pulverosus Sharp, 1882, Trans. Roy. Dublin Soc. (2) ii. p. 609.
Rhantus pulverulosus Broun, 1893, Man. N. Zeal. Col. vi. p. 1333.
Rhantus dispar Régimbart, 1899, Ann. Soc. ent. Fr. lxviii. p. 308.
Rantus pulverosus F. Balfour-Browne, 1938, Syst. Notes Brit. Aq. Col. (i. p. 69).
? *Dytiscus punctatus* Fourcroy, 1785, Ent. Paris, i. p. 70 (*non* Müller, 1776 [*]).

The type of *C. suturalis* MacLeay, preserved in the British Museum collections, is very fortunately a male which has the anterior tarsi and tarsal claws well preserved and exactly similar to those of specimens from Europe, Japan, and Australia.

According to Zimmermann [†] *Rantus dispar* (Régimbart) is a synonym of *R. suturalis*. The description of the male tarsal claws of Régimbart's species agrees very well with what is seen in MacLeay's type and in the holotype of *R. pulverosus* (Stephens). In each of the two latter types there is a weakly marked primary reticulation within the larger areoles, just as is described by Régimbart for *R. dispar*. The difficulty of identification rests on the description of the females of *R. dispar*, which indicates a form not known in the widespread species.

Through the kindness of M. Guy Colas of the Muséum National d'Histoire Naturelle, Paris, I have seen two ♂♂ and two ♀♀ of the type-series of *R. dispar*, and I am able to state that the males agree perfectly with the holotype of *R. suturalis*. That the females are also of this species I have little doubt, and they appear to represent a dimorphic form of this sex which is not, so far as my material goes, paralleled in this species. The same phenomenon is to be seen in *R. bistriatus* (Bergst.)*, in which ♀♀ from Calgary, North America, in the British Museum are much more deeply reticulated than European specimens, although the ♂♂ are quite similar in both localities. The form of the female described by Régimbart should be known as *Rantus saturalis* forma ♀ *dispar* (Régimbart). So far as I know, it is confined to Java. I have no other ♀♀ from that Island and cannot say if the normal form occurs there. Csiki † records the species as *C. pulverosus* (Steph.) from Sumatra and Java, which suggests that both forms do occur together.

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[*] Müller, 1776, Zool. Danicæ Prodrom. p. 73.

[†] Zimmermann, 1917 (1919), Arch. Naturg. lxxxiii. A (12), p. 218; 1920, Coleopt. Cat. Junk, pars 71, p. 206.

Rantus discicollis (Aubé).

Colymbetes discicollis Aubé, 1838, in Dejean, Spec. Col. vi. p. 250.
? *Rhantus punctatus* Régimbart, 1899, Ann. Soc. ent. Fr. lxviii. p. 306.
? *Rhantus suturalis* Zimmermann, 1917 (1919), Arch. Naturg. lxxxiii. A (12), p. 218.

There is a single male specimen, 10 mm. long, in the British Museum, labelled "*Colymbetes discicollis* Aubé, Gehin, Java," which I have little doubt is the true Aubéan species. This has, as Aubé describes it, the head quite covered with very small punctures, only a very small amount of reticulation at the sides, near the eyes, in marked contrast to *R. suturalis*. The protarsal claws of this specimen are alike, equal in length, long and thin, the under edge nearly straight from the apex to the enlarged basal portion; the mesotarsal claws, in contrast to those of *R. suturalis*, are short and deep, equal in length, the inner (posterior) more conspicuously falciform. The pronotum is coloured exactly as described by Aubé, the large, vague infuscation contrasting with the small well-defined spot of *R. suturalis*. This species also has a visible primary reticulation within the larger areoles of the elytra.

DYTISCINÆ.

Hydaticus pacificus Aubé.

Hydaticus pacificus Aubé, 1838, in Dejean, Spec. Col. vi. p. 177 (Timor).
Dytiscus ruficollis Fabricius, 1787, Mant. Ins. i. p. 189 (Siam).

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* *Vide* Sharp, 1882, Trans. Roy. Dublin Soc. (2) ii. p. 198.
† Csiki, 1937, Arch. Hydrobiol. Suppl. Bd. xv. p. 129.

Hydaticus discindens Walker, 1858, Ann. & Mag. Nat. Hist. (3) ii. p. 204 (Ceylon).
Hydaticus bihamatus var. *pacificus* Sharp, 1882, Trans. Roy. Dublin Soc. (2) ii. p. 657.
Hydaticus dislocans Walker, in Coll. British Museum.

The type of *D. ruficollis* Fabricius is in the Banks Collection in the British Museum. Zimmermann * makes the species a doubtful synonym of *H. goryi* Aubé, and gives the locality as Tasmania, although the original description states "Habitat in Siam." The type shows that the correct position of this species is with *H. pacificus*, which will be the valid name, the Fabrician name being a homonym of *D. ruficollis* Degeer †.

There is no specimen in the British Museum labelled *discindens* in Walker's handwriting, but there is a specimen from Ceylon, of the set received from Walker (B.M. 59–106), which bears a label "*dislocans*" in Walker's handwriting and also a label "*Hydaticus dislocans* Walker. Ann. Nat. Hist. (Type)" in Adam White's handwriting. The type of *H. fractifer* Walker, correctly labelled "*fractifer*" in Walker's handwriting, and "*Hydaticus fractifer* Walker. Ann. Nat. Hist. (Type)" by Adam White, indicates that between labelling the specimen "*dislocans*" and the date of publication with the name "*discindens*" Walker changed the name without altering the label. *H. discindens* Walker is conspecific with *H. pacificus* Aubé, not with *H. bihamatus* Aubé as stated by Zimmermann ‡.

Dissection disproves in part Sharp's view that *H. goryi*, *H. bihamatus*, and *H. pacificus* are three extreme forms of one species. *H. pacificus* is quite distinct, but *H. goryi* and *H. bihamatus* are conspecific, and the latter has page priority of publication (fig. 4, *b*).

Hydaticus bihamatus Aubé.

Hydaticus bihamatus Aubé, 1838, in Dejean, Spec. Col. vi. p. 174.

I have dissected Philippine examples of this species, and find that Sharp was quite mistaken in supposing it to be conspecific with *H. pacificus*, the ædeagus of which is quite distinct (fig. 4, *a*). Further dissections show that *H. goryi* Aubé has a form of ædeagus identical with that of

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* Zimmermann, 1920, Coleopt. Cat. Junk, pars 71, p. 220.
† Degeer, *loc. cit.*
‡ Zimmermann, *loc. cit.* p. 218.

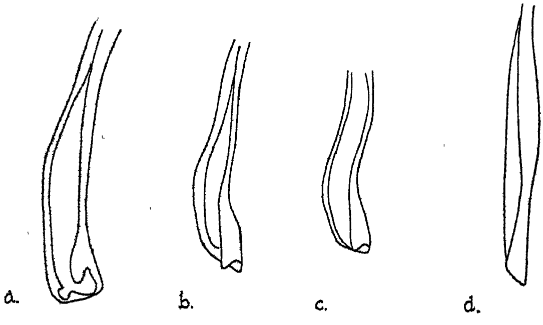
H. bihamatus. As *H. goryi* is generally easily recognizable from this form of the species on the colour-pattern, and is widespread, whereas *H. bihamatus*, so far as my material goes (Sharp's Malacca specimens are *H. pacificus*), is confined to the Philippines, I propose to treat *goryi* as a subspecies, *H. bihamatus* having page priority and therefore being the valid species.

Hydaticus bihamatus subsp. *goryi* Aubé.

Hydaticus goryi Aubé, 1838, in Dejean, Spec. Col. vi. p. 175.
Hydaticus scriptus Blanchard, 1853, Voy. Pôle Sud. iv. p. 46 ; Atlas, ii. pl. iv. fig. 1.
Colymbetes clairvillei Montrouzier, 1860, Ann. Soc. ent. Fr. (3) viii. p. 242 (*teste* Fauvel).
Hydaticus banksi Crotch, 1872, in Harold, Col. Hefte, ix.–x. p. 205.

As stated above, under *H. bihamatus*, I propose that this form, in which the ædeagus is identical with that of that species, should be treated as a subspecies.

Fig. 4.



Apex of the ædeagus.

(a) *Hydaticus pacificus* Aubé; (b) *Hydaticus bihamatus* Aubé; (c) *Hydaticus batchianensis* Sharp; (d) *Hydaticus fractifes* Walker.

Hydaticus batchianensis Sharp.

Hydaticus goryi var. *batchianensis* Sharp, 1882, Trans. Roy. Dublin Soc. ii. p. 656.
Hydaticus batchianensis Régimbart, 1899, Ann. Soc. ent. Fr. lxviii. p. 319.

Dissection confirms Régimbart's opinion that this species is specifically distinct from *H. goryi*, although the two species are extremely closely related (fig. 4, *c*).

Hydaticus batchianensis subsp. *similis* Régimbart.

Hydaticus batchianensis var. *similis* Régimbart, 1899, Ann. Soc. ent. Fr. lxviii. p. 319 (Aru, New Guinea, Solomon Is.).
? *Colymbetes trivittatus* Montrouzier, 1855, Ann. Soc. agr. Lyon, vii. p. 8 (Woodlark Id.).

Zimmermann * gives Montrouzier's species as a doubtful synonym of *H. bihamatus* Aubé. To my mind the description clearly indicates a form of *H. bihamatus*, and the particular locality of Montrouzier's species is suitable to this explanation. Régimbart's form has a range extending through Woodlark Island, and the description of *H. trivittatus* agrees in all respects with the subsp. *similis* from the Solomon Islands except for the elytra described as "brunes." A supposition that the type of Montrouzier was immature would explain the peculiar colour of the specimen. The probability therefore that the two forms are the same is very strong, and if it can be proved Montrouzier's name will have priority.

Hydaticus fractifer Walker.

Hydaticus fractifer Walker, 1858, Ann. & Mag. Nat. Hist. (3) ii. p. 204.
Hydaticus bihamatus var. 3, Sharp, 1882, Trans. Roy. Dublin Soc. (2) ii. p. 657.
Hydaticus andamanicus Régimbart, 1899, Ann. Soc. ent. Fr. lxviii. p. 319.
Hydaticus pacificus Zimmermann, 1920, Coleopt. Cat. Junk, pars 71, p. 223 (ex parte).

Although placed by Zimmermann in synonymy with *H. pacificus* this is not the correct position, the species being, as far as the material at my disposal goes, fully valid. It is notably narrower, and therefore appears more elongate than *H. pacificus*; it possesses the inverted W-mark between the eyes, which is not present in the true *H. pacificus*, it has the postmedian and subapical flavous bands much reduced or non-existent, and the pronotum widely suffused with fuscous. The specimens from which this description is taken are four, including the holotype, from Ceylon. The only Andamans specimen I have seen is dwarfed, and the narrow form is less conspicuous. One of the Ceylonese specimens bears Sharp's label as in the synonymy (fig. 4, *d*).

It should be noted that Sharp gave this form no name, and that *andamanicus* is due to Régimbart, who states that he named the species from Sharp's description and without having seen any specimens.

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* Zimmermann, *loc. cit.* p. 218.

Sandracottus guerini, nom. nov.

Dytiscus flavo-cinctus Guérin-Méneville, 1830, Voy. 'Coquille,' Atlas, pl. i. fig. 18; text, 1836, p. 61.

Guérin's name is unfortunately a simple homonym of *Dytiscus flavocinctus* Hummel, accepted as a variety of *Dytiscus circumcinctus* Ahrens by Zimmermann. Guérin's species is undoubtedly a very distinct *Sandracottus*, the only one yet known from New Guinea. I propose for it the name *guerini*.

XI.—*The Lice of Petrels.*—Part II.[*] *The elongate Forms.* By GORDON B. THOMPSON.

[Continued from vol. ii. p. 493.]

THE elongate forms of Mallophaga from petrels constitute a compact group of parasites having a characteristic facies. As a group, however, they show a number of marked differences among themselves, which make it rather impossible for one to give a single description covering all of them. Since the ten genera which contain all the species in question are separated from one another mainly on the head markings (as seen in cleared specimens), I have considered it the best plan to describe the head structures of the genus *Halipeurus* as a type, and to point out the modifications occurring in the remaining genera.

In the genus *Halipeurus* the head is almost twice as long as broad, tapering gradually anteriorly, with rounded clypeal front and evenly concave occiput. The dorsal surface of the head is composed of a number of fairly sharply defined sclerites and is divisable into three fairly distinct regions: (1) a posterior epicranial region, extending from the occiput to a line joining the bases of the antennæ; (2) a frontal region, extending from the antennæ to the clypeal suture; and (3) the clypeal region in front of this suture.

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[*] Part I. appeared in Ann. & Mag. Nat. Hist. ser. 11, vol. ii. 1938, pp. 481–493.

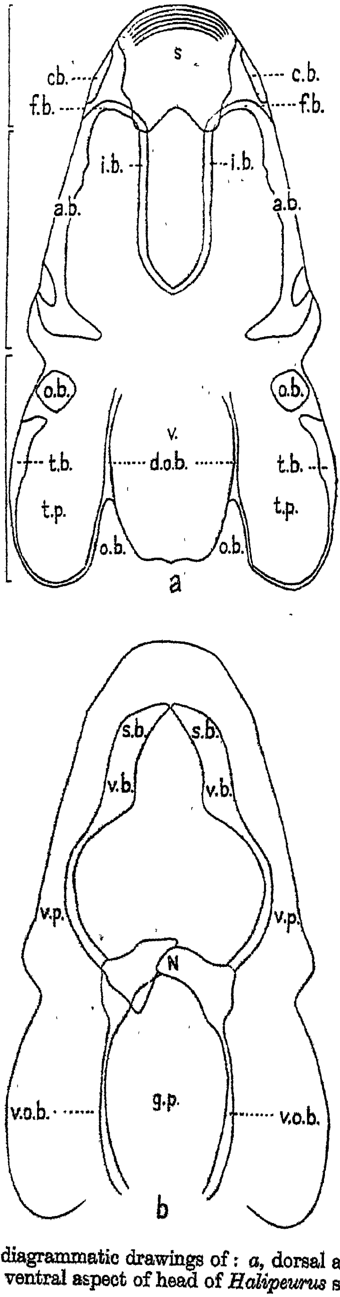
The epicranial region is composed of two lateral temporal plates (fig. 1, *tp.*), each of which covers rather more than a third of the surface, and which are limited internally by the ill-defined dorsal occipital bands (fig. 1, *d.o.b.*), the latter having between them the uncoloured vertex (fig. 1, *v.*). The temporal plates are continued round the sides of the head on to the ventral surface, where they are similarly limited by the ventral occipital bands (fig. 1, *v.o.b.*), between which lies the strongly coloured gular plate (fig. 1, *g.p.*). Chitinous thickenings laterally and posteriorly, seen in optical section, give rise to the temporal bands (fig. 1, *t.b.*) and occipital blotches (fig. 1, *o.b.*). The eye, perforating the temporal band close to its anterior end, cuts off a rounded ocular blotch (fig. 1, *o.b.*) in front.

The frontal region also exhibits a median lightly coloured area, lying between two more heavily chitinised lateral areas. The latter are limited externally by the antennal bands (fig. 1, *a.b.*), anteriorly by the frontal bands (fig. 1, *f.b.*), and internally by the internal bands (fig. 1, *i.b.*). The ventral surfaces of frons and clypeus are not separated, and will be dealt with after description of the latter.

The clypeus is composed dorsally of the signature (fig. 1, *s.*), a chitinous plate broader in front and narrowing posteriorly, which is flanked by short clypeal bands (fig. 1, *c.b.*). The clypeal suture lies between the clypeal bands and the posterior border of the signature and the frontal bands. The signature is variable in form in the different genera, and is of considerable diagnostic value. In *Halipeurus* it has a series of crescentric lines upon the anterior border, and is usually of the shape shown in the figure (fig. 1, *s.*).

From the anterior portion of the clypeal bands a pair of ventral bands (fig. 1, *v.b.*) run downwards, inwards, and backwards for a short distance, then turn sharply and diverge as the internal borders of a pair of narrow ventral plates (fig. 1, *v.p.*), which run back to the mandibles and offer a condyle for the anterior facet. Lying between them, just in front of the mandibles, is a hinged flap, the labrum, which is supported by chitinous bars laterally and anteriorly. There is a small uncoloured immovable trabecula in front of the antennæ, which latter is simple

Fig. 1.



Semi-diagrammatic drawings of: *a*, dorsal aspect, *b*, ventral aspect of head of *Halipeurus* sp.

in the female, and has the third segment obliquely produced into an appendage, and the two terminal segments inserted dorsally in the male.

I am leaving out of account the rather complex chitinous structure, which offers a facet for the posterior articulation of the mandible. No tentorium is present. The hypopharynx is well developed in its typical form.

In *Philoceanus* the posterior half of the head differs from the type only in having a sinuous occiput, the occipital blotches embracing two projections with a concavity between them. The anterior part differs radically. There is no clypeal suture, the antennal and clypeal bands being continuous. The frontal bands are only slightly chitinous and require careful tracing to their junction with the antennal bands. They bend round internally to form short inconspicuous internal bands. The ventral bands can be traced under a high power, but are not specially chitinised. The signature has a strong band along its anterior border; concave sides supported by pear-shaped incrassations, which have their broader ends directly posterior, and which exhibit a concentric grooving similar to that occurring on the points of the mandibles; and a broad triangular hinder end, with the apex directed backwards. It bears on its surface a pear-shaped depression, the gutta, flanked by two lateral grooves, into which fit the heads of the signature bars. The labral expansions, upon which Kellogg originally founded the genus, vary in extent.

Pelmatocerandra has the head shorter and broader, the occipital blotches being wider apart and the occiput flatly convex between them. The occipital bands are much more definite, reminding one of the condition in *Giebelia*. The ocular blotch is large, the temporal bands very narrow. The anterior half of the head is very distinct in character. The signature is very similar in shape to that of *Philoceanus*, but the anterior border bears a number of crescentric lines, the gutta, lateral grooves, and marginal incrassations are absent. A clypeal suture is present. The antennal bands, which are narrow posteriorly, widen at the suture, so that the frontal bands are broad and directed obliquely forwards, fading completely away at their anterior limit, from which point the internal bands run backwards as short broad blotches. From a narrow base in front of the antenna an elongated triangular blotch runs forward parallel to the antennal and frontal bands. This last is absolutely characteristic of the genus, though an analagous structure occurs in *Giebelia*, which lends support to its inclusion with these groups and not to the Philopteridæ.

The head of *Synnautes* closely resembles that of *Halipeurus*, but is more slender and has a more concave occiput. The clypeal bands and, in particular, the ventral bands, are better developed. The signature has a broad crescentric ringed border, and no gutta nor lateral grooves. The signature bars are not developed. A clypeal suture is present. The internal bands are short.

The genus *Naubates* * has a very distinct head, more heavily chitinised than any of the other genera, and with very remarkably developed signature bars (these structures are modifications of the borders of the ventral plate) and with a sinuous occiput. The anterior border of the clypeus bears crescentric rings. A clypeal suture is present, and in some species of the genus the antennal bands are broken by a frontal suture at their junction with the frontal bands. The dorsal occipital bands are scarcely demonstrable, but ventral occipital bands are well developed.

In the genus *Pseudonirmus* the whole general appearance of the head is modified by the fact that the frontal bands fuse to form a continuous line bounding the frons anteriorly, a small chitinous bar running backwards from this in the mid-line representing the fused internal bands. A clypeal suture is present in two of the species but not in *P. charcoti* (Neumann). In the three species known to date, it will be noticed that the clypeus gradually tends to disappear. Dorsal occipital bands are well developed.

In *Episbates* the clypeus, with its suture, bands, and signature are entirely absent. The antennal and frontal bands form a continuous line round the anterior margin of the head.

Included in the genus *Perineus* are three fairly distinct types of head. The general characters which distinguish the members of this genus are the greater development of occular and occipital blotches, the absence of occipital bands, and of a distinct clypeal suture, though the latter is usually indicated, and the slight development of the usual clypeal sutures. The signature itself is not conspicuous. Most species have a slight crescentric ringed border.

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* The subgenus *Micronaubates* of Pessôa and Guimarães (1935) will be discussed later.

Harrisoniella differs from *Perineus* in having the signature bars, which are by no means conspicuous.

In the genus *Bedfordiella*, as already pointed out by me in the original description, the clypeus and clypeal suture are distinct; the clypeus is similar to that of *Philoceanus*, but without gutta or lateral grooves; the anterior bands are thick, narrowing towards the mid-line, which they do not reach; there are no internal bands; the ventral bands are indicated anteriorly; the occipital and ocular blotches and the bases of the antennal bands are large, as in *Pseudonirmus*.

The thorax, abdomen, etc., of these elongate forms will be dealt with in the detailed descriptions of the genera and species in future contributions.

Key to the Genera.

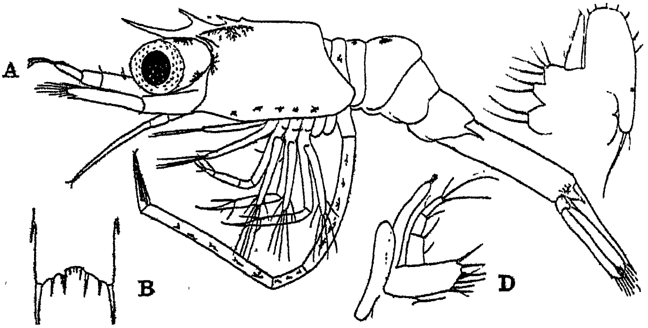
1.	Small forms from small petrels	2.
	Larger forms	3.
2.	Slender forms with narrow head; no clypeal suture	*Philoceanus.*
	Stouter forms with broad head; clypeal suture distinct	*Pelmatocerandra.*
3.	Antennal, anterior and internal bands well developed	4.
	Antennal, anterior and internal bands not well developed	6.
4.	Pleura straight, cuticle scaly, ♀ abdomen sharply two-pointed	*Synnautes.*
	Pleura erose, ♀ abdomen bluntly two-pointed	5.
5.	Ventral bands hardly developed	*Halipeurus.*
	Ventral bands strongly developed	*Naubates.*
6.	Anterior bands uniting in the middle line....	7.
	Anterior bands not uniting in the middle line.	8.
7.	With clypeal region in front of anterior bands.	*Pseudonirmus.*
	Without clypeal region....................	*Episbates.*
8.	Clypeus clearly marked off	*Bedfordiella.*
	Clypeus not clearly marked off	9.
9.	Signature bars present	*Harrisoniella.*
	Signature bars absent	*Perineus.*

XII.—*A late Larval Stage of the Sargassum Prawn,* Leander tenuicornis *(Say), and a Note on the Statocyst of the Adult.* By Robert Gurney.

When describing the first two stages in the development of this species from the Red Sea (Gurney, 1938, p. 414) I was able to point out some striking differences between it and other Palæmonidæ, and suggested that these differences, together with certain peculiarities of the adult, were sufficient to separate the species from the genus *Leander*.

The first larva hatched from parents taken at Bermuda is precisely the same as that of the Red Sea specimens.

Fig. 1.



Leander tenuicornis (Say).

A. Stage V ?, side view.
B. Part of telson.
C. Maxilla.
D. Maxillipede 1.

In spite of the abundance of the species in the Sargassum weed only one larva was obtained in the plankton, and this, which was probably in Stage IV, moulted to a fifth stage. At this stage, which does not correspond precisely to any stage in the development of the European *Leanders*, the larva shows difference from other species as great as those shown by Stage I.

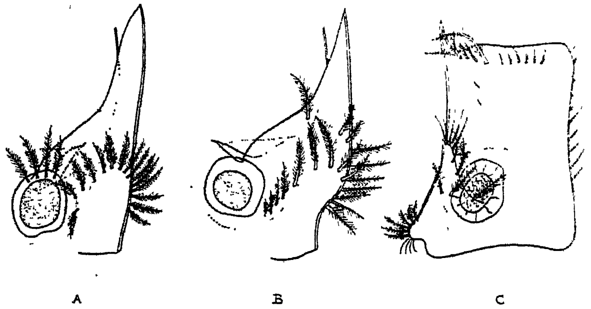
Stage V ? Length 6·4 mm.

Rostrum with two large, slightly serrated, teeth; carapace with supraorbital spine, small anterior papilla, and sharp anterior angle. Abdominal somites 5 and 6 with lateral spines. Telson about twice as long as wide, parallel-sided, with one pair of lateral spines and 5+5 spines on the concave distal end.

Antennule with exopod unsegmented and terminal æsthetes; endopod a small knob; segment 1 without ventral spine. Endopod of antenna a little longer than exopod, with two basal segments distinct.

Maxillule with endopod slender, bearing two long setæ. Maxilla with endopod slender, without basal lobe; exopod with anterior part broad, with seven setæ, and the proximal part narrow with large apical seta; outer margin partly bare.

Fig. 2.



A. Statocyst of *Leander tenuicornis* (Say).
B. Statocyst of *Periclimenes americanus* (Kingsley).
C. Segment 1 of antennule of *Anchistioides antiguensis* (Schmitt).

Maxillipede 1, basis hatchet-shaped as in Stage I; endopod of three segments. Basis of maxillipede 2 with large spine. Maxilliped 3 and legs 1 and 2 without large spines on basis. Legs 1 and 2 not chelate. Legs 3 and 4 rudimentary, leg 3 biramous, leg 4 uniramous. Leg 5 very large, reaching forward beyond the eyes; margins of segments smooth; dactyl with strong basal spine.

There are four pleurobranchs only.

Pleopods absent. Uropods with numerous setæ.

The moulted skin of the previous stage was lost except for the antennules and antennæ, which differ scarcely at all from the stage described.

The chief differences between this larva and the larva of other species of *Leander* are these :—leg 5 is enormously developed and bears the same proportion to the other legs as in *Brachycarpus** and *Leander paucidens*. It also develops precociously, since it is of full size when legs 3 and 4 are rudimentary. In other species of *Leander* there is some precocity, since leg 4 is rudimentary when leg 5 is fully formed, but leg 3 is already developed. This development of leg 5 before either leg 3 or 4 is seen also in *Palæmonetes varians,* but not in *P. vulgaris.*

In *L. tenuicornis* leg 4 appears to have no exopod, though perhaps it is not safe to be positive on this point until later stages have been seen. All species of *Leander*, except *L. longirostris*, have this exopod.

It will also be noticed that legs 1 and 2 have not the slightest trace of chelæ, whereas the chela is traceable in Stage IV and fully formed in Stage V in other Leanders. Presumably *L. tenuicornis* will have at least two more stages before post-larval, making seven in all. In *L. serratus* and other European species there are usually five only, whereas there are six in *L. paucidens* (Yokoya, 1931).

First post-larval Stage.

Very small specimens of this species were found to be common in floating *Sargassum* in July, and one of these appears to be in Stage I.

Stage I. Length 8 mm.

Rostrum rather deep, with nine dorsal and four ventral teeth ; two of the dorsal teeth are on the carapace. The setæ of the ventral margin are not of the rich yellow colour seen in the adult. Carapace with antennal and branchiostegal spines, but without trace of supraorbital.

Exopod of antennule with fused basal part ·26 mm., the sensory flagellum ·36 mm. The antennule is, in this respect, much further developed than it is in *L. longirostris* for example. Outer flagellum 4 mm. Statocyst fully formed, but without statolith.

Mandibles with minute papilla representing palp. Maxilliped 3 with long exopod bearing six setæ. There is therefore, no temporary reduction such as is seen in the European species.

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* One of the species of the larval genus *Retrocaris* is now known to be the larva of *Brachycarpus biunguiculatus*.

	Post-larval I., 8 mm.						Adult male, 2 mm.					
	Total length (mm.).	Dact.	Prop.	Carp.	Mer.	Isch.	Total length (mm.).	Dact.	Prop.	Carp.	Mer.	Isch.
Leg 1 ...	2·38	100	67	87	117	84	6·77	100	67	117	155	86
2 ...	3·47	..	66	97	106	103	11·45	..	88	112	113	86
3 ...	3·17	..	225	114	226	105	9·52	..	266	138	266	125
4 ...	3·47	..	234	112	216	115	10·73	..	320	154	276	135
5 ...	4·09	..	350	200	320	170	11·18	..	340	155	252	136

Legs 2 and 3 with very small vestiges of exopods; none seen on leg 4.

Measurements of Legs.

The change in proportions of the segments of legs 1 and 2 is so small that it may be said that the adult form is practically reached in the first stage. In European species (*P. varians*, *L. longirostris*, *L. squilla* Gurney, 1924) the changes with growth are very marked. Such change as there is is in the same direction, namely, increase in length of the palm of the chela and of the carpus in proportion to the dactyl.

Leg 5 is considerably longer in proportion to leg 4 than it is in the adult.

Pleopod 1, endopod very small, without setæ. Pleopod 2 endopod nearly as long as exopod, with large *appendix interna*.

Apex of telson differing from that of adult in having a much smaller median point. The two large terminal spines are wide apart, leaving the two median feathered setæ, which are covered by them in the adult, quite free.

The Statocyst.

A difference between *L. tenuicornis* and other species of *Leander* which has not hitherto been noticed is found in the statocyst.

In all species this is a delicate sac with a pear-shaped opening covered by an extension of the stylocerite, and on the floor of the sac is an oval pad surrounded by sensory hairs. These hairs are arranged all round the pad in *L. serratus* (Shen, 1934, fig. 19), but in *L. tenuicornis*, *L. longirostris*, *L. pacificus*, and *Palæmonetes varians* there is a wide gap in the series of setæ at the posterior end. In all these species, except *L. tenuicornis*, the statocyst contains small grains which are introduced from outside. In *L. tenuicornis*, on the other hand, there is a large concretion completely covering the pad. This concretion, which is flattened and nearly circular, measures about ·45 mm. It has a dark centre and a light peripheral region with faint concentric lines. Placed in strong acid it dissolves entirely, leaving a very delicate enveloping membrane, so that it is presumably a calcareous secretion.

In his survey of the statocysts of Decapoda Shen (1934) mentions no species of Caridea with a single autogenous statolith. Among the Penæidea it is well known that there is a single statolith in *Lucifer* and *Sergestes* which is supposed to be of organic substance, since it disappears in caustic soda. In *S. robustus* it is ·6 mm. long, drawn out at one end into a sort of stalk, and with peculiar rods projecting from its surface. It is, in fact, altogether unlike the statolith of *L. tenuicornis*.

Among the Caridea an undescribed species of *Leptochela* from Bermuda has a statocyst containing a very small circular statolith which is dissolved by caustic soda, and may be of the same nature as that of *Lucifer* and *Sergestes*.

Huxley (1851) noted a single statolith in the antennule of a "*Palæmon*" from the South Pacific, and Leuckaart (1853) found one in "*Hippolyte viridis*." Hensen also (1863) noted a similar statolith in an "*Hippolyte*" which he did not identify. As Shen states that there is no statocyst in any of the Hippolytidæ seen by him these records by Leuckart and Hensen must be in error, but it is possible that Huxley was actually dealing with *L. tenuirostris*.

In *Periclimenes americanus* the statocyst has an opening as in *Leander*, and there is a large flat statolith which is dissolved by acid.

In *Anchistioides antiguensis* the statocyst is apparently closed, and contains a single large statolith, which is shown in Miss Gordon's figure (1935, fig. 26 *b*). It is flattened, irregular in outline, with a rather darker centre and radial markings on the periphery. In acid it dissolves leaving a membranous envelope. It rests, as in *Leander*, on the bent tips of about 80 setæ arranged in a horse-shoe shape on a thick cushion.

The occurrence of this type of calcareous statolith seems to be confined to the Palæmonidæ, and it is remarkable that it should be found in single species of large genera. There are other reasons why *L. tenuicornis* should be removed from the genus *Leander* (Gurney, 1938, p. 14), but *Periclimenes americanus* is not, so far as I am aware, in other respects an aberrant member of its genus.

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XIII.—Corydoras arcuatus, *sp. n., an Amazonian Catfish.*

By MARGERY G. ELWIN, B.Sc.

[Plate III.]

AMONG a number of fishes recently imported into England by an aquarium dealer, there appeared a hitherto undescribed species of the South American genus *Corydoras*. This came via Germany and without a note of the locality. The following description is based on a specimen, the type, which I have deposited in the British Museum (Natural History), where I have had the privilege of comparing the new species with others and of consulting the literature. Since the type was described, a smaller specimen has been received for determination at the British Museum (Nat. Hist.) from Mr. J. Paul Arnold of Hamburg. The locality of this fish is given as Teffe, Amazon, and notes on it are given below.

Corydoras arcuatus, sp. n.

Depth of body 2½ in the length, length of head 3¾. Diameter of eye 4 in length of head, interorbital width 2.

Snout longer than postorbital part of head. Suborbital very narrow, its depth less than diameter of eye. Barbels reaching antero-ventral margin of operculum.

Dorsal I. 7; spine equal to length of head, first ray slightly the longest; free edge convex; base equal to its distance from the adipose fin, which is preceded by a spine and three median scutes. Anal I. 6; hard ray short. Caudal deeply cleft to slightly over half its length, dorsal lobe very slightly larger than ventral. Pectoral spine equal to dorsal spine in length, extending well beyond the base of the pelvic fin. Scutes $\frac{24}{22}$. Humeral shields not in contact below, separated from the base of the pelvic fin on each side by a single scute.

The marking is very characteristic. A bold black band, 3 mm. wide, slightly more at the anterior end, runs along each side, starting with its centre at the corner of the mouth, passing back through the eye and following the curve of the body close to the dorsal ridge as far as the caudal peduncle. The band crosses the caudal peduncle at a slightly sharper angle to fade out into the beginning of the lower lobe of the caudal fin. The right and left lateral bands are about 2 mm. apart in the dorsal region.

The sides are greyish in colour, the belly white. The lobes of the caudal fin show slight black pigmentation, the other fins are unpigmented. There is a marked golden-green iridescence along the lateral line and the ventral edges of the scutes. The eye is black, with a narrow yellow ring round pupil.

Standard length 46 mm.

Second specimen :—Standard length 37 mm. Depth of body $2\frac{2}{3}$ in the length, length of head $3\frac{1}{2}$. Diameter of eye $3\frac{2}{3}$ in length of head. Barbels very short, not reaching to level of anterior margin of eye. Scutes $\frac{22}{20}$. In all other respects it agrees exactly with the type.

The species which *C. arcuatus* most closely resembles is *C. melini* Lönnberg & Rendahl (Ark. Zool. Stockholm, 22 A, no. 5, 1930), the types of which came from the junction of the Rio Papuri and Rio Uaupes, an affluent of the Rio Negro, Amazon system. *C. melini* differs from *C. arcuatus* in the narrower interorbital region

(2·42–2·57 in the head), the shorter dorsal and pectoral spines, and in coloration. The black lateral band in *C. melini* terminates in front at the anterior end of the dorsal fin, the black pigmentation extending on to the base of the dorsal; a separate transverse band runs across the head and down through the eyes.

Thanks are due to Mr. L. C. Mandeville for photographing the live specimen.

EXPLANATION OF PLATE III.

Corydoras arcuatus, sp. n. (type).

XIV.—*Papers on Oriental* Carabidæ.—XXXV.

By H. E. Andrewes, F.R.E.S.

On the Types of some Indian Genera.

In 1930 my 'Catalogue of Indian Insects,' Part 18—Carabidæ, was published in Calcutta, and in it an attempt was made to provide a record of all the hitherto described genera and species of this family found in South East Asia, excluding only the predominantly palæarctic and Australasian parts of the fauna found respectively in Southern China and Japan in the north, and in New Guinea in the south. The number of genera included in this work was 262, but numerous new genera have meanwhile been described, and, allowing for all the changes made during the past eight or nine years, the number is now 313. These may be divided into:—(i.) Palæarctic genera, which are being dealt with in the series entitled "The Generic Names of British Insects," now in course of publication by the Royal Entomological Society of London, (ii.) Monotypic genera, in which only one species was included at the time of publication, (iii.) Genera for which a satisfactory type has already been fixed, (iv.) Genera for which, as a rule, no type has been fixed. The last section, including 43 genera, is the only one dealt with here, and it consists of:—(*a*) those genera which are not monotypic and for which no type has hitherto been selected, and (*b*) genera for which a type has been chosen which proves to be invalid, or in regard to which questions have presented themselves which seem to require discussion.

As this memoir forms only a preliminary survey, the alphabetical order in the Catalogue has been retained here. When my two volumes on the Carabidæ in the series 'Fauna of British India' were published I was insufficiently informed as to the rules regarding the choice of genotypes, and one or two of the selections there made prove to be invalid. I am glad to take the opportunity of correcting them here.

In regard to the selection of genotypes in cases where the names of two or more species follow the description of the genus, if the author gives any indication that he has one species in mind rather than another, this one has been chosen. Otherwise, that is to say when the species seem to have been regarded as all on the same footing, the species first to be described has been selected.

Except where their introduction appeared desirable, synonyms have been excluded.

ABACETUS.

Dejean, 1828, Spec. Gén. Col. iii. p. 195.
Hope, 1838, Col. Man. ii. p. 111.

Type (monotypic)=*Abacetus gagates* Dejean, 1828.

Synonym.—*Distrigus* Dejean.

Note 1.—In Dejean's work the genus *Distrigus* is placed four pages in front of *Abacetus*, but the latter name has been in use for very many years, and as no question of author's priority arises, it would be very undesirable to revert to *Distrigus* now.

Note 2.—Hope selected *Distrigus bipustulatus* Brullé (now included in the genus *Celioschesis* Tchitcherin) as type of *Distrigus*, and *Distrigus crenulatus* Dejean as type of *Abacetus*, but both fixations are invalid, as neither species was among those included by Dejean under either genus.

ACINOPUS.

Latreille, 1829 (April), in Cuvier's Règne Anim. ed. 2, iv. p. 389.
Dejean, 1829 (December), Spec. Gén. Col. iv. p. 33.
Hope, 1838, Col. Man. ii. p. 88.

Type (fixed by Hope)=*Carabus* (*Scarites*) *picipes* Olivier, 1795.

Note.—The following names are mentioned in a note after the description of the genus:—" *Harpalus megacephalus* Latr., Gen. Cr. et Ins. i. p. 206; *Carabus megacephalus* F.; Ross. Faun. Etrusc., Append. tab. iii. H; *Acinopus megacephalus* Dej. Catal."

Dejean prefaces the description of his *A. megacephalus* with a list of synonyms, of which *Carabus megacephalus* Illiger, 1802, stands first, while *Scarites picipes* Olivier is also included. No mention is made of Rossi, whose *Carabus megacepahlus*, 1794, is quite a different species.

AMAROSCHESIS.

Tchitcherin, 1897, Abeille, xxix. p. 28.

Type (fixed here)=*Zabrus chinensis* Fairmaire, 1886, the first described of the three species named by Tchitcherin.

AMBLYSTOMUS.

Erichson, 1837, Käf. Mark Brandenb. i. p. 59.

Type (fixed here)=*Acupalpus mauritanicus* Dejean, 1829.

Note.—The description of the genus was followed by the names of four species, all, except the first, included by Dejean in his genus *Acupalpus*, viz., *Carabus smaragdulus* F., *A. mauritanicus* Dej., *A. metallescens* Dej., and *A. quadrillum* Dej. The first of these was subsequently (1855) adopted by Motchulsky as the type of his genus *Egadroma* (= *Stenolophus*), and the next in order is here selected as the type of *Amblystomus*.

AMOLOPS *.

Tchitcherin, 1898, Abeille, xxix. p. 107.

Type (fixed here)=*Molops piliferus* Bates, 1878, the first mentioned and first described of the two species named by Tchitcherin.

ANCUS.

Putzeys, 1867, Ann. Soc. Ent. Belg. x. p. 117.

Type (fixed here)=*Clivina bicornuta* Putzeys, 1863. Of the five species enumerated this was the first described.

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* See note at end.

ANDREWESIUS.

Jedlička, 1932, Ent. Nachr. Bl. vi. p. 74.

Type (fixed here) = *Andrewesius vimmeri* Jedlička, 1932, the first of the two species cited.

ANTHIA.

Weber, 1801, Obs. Ent. p. 17.
Latreille, 1810, Consid. gén. ordre Nat. Anim. Comp. Crust. Arach. et Ins. p. 426.
Hope, 1838, Col. Man. ii. p. 50.

Type (fixed by Latreille) = *Carabus sexguttatus* Fabricius, 1775.

Note.—Hope made *Carabus thoracicus* F., 1787 (= Thunberg, 1784), the type of *Anthia*, but this species is not mentioned by Weber, so that the fixation is invalid. At the same time he made *Carabus sexguttatus* F. the type of a new genus *Pachymorpha*, now treated as a subgenus of *Anthia*. Some rearrangement of subgenera will be needed here.

ARISTOCHROA.

Tchitcherin, 1898, Hor. Soc. Ent. Ross. xxxii. p. 70.

Type (fixed here) = *Platysma latecostata* Fairmaire, 1887, the first to be described of the five species enumerated by Tchitcherin.

BRACHYONYCHUS.

Chaudoir, 1878, Ann. Soc. Ent. Belg. xxi. p. 86.

Type (fixed here) = *Epicosmus sublævis* Chaudoir, 1869, the first to be described of the three species named.

CALATHOMIMUS.

Bates, 1886, Ann. & Mag. Nat. Hist. (5) xvii. p. 77.

Type (fixed here) = *Calathomimus maculatus* Bates, 1886, the first of the two species described.

CALLEIDA.

Latreille et Dejean, 1824, Hist. Nat. et Ic. Col. Eur. p. 132.
Hope, 1838, Col. Man. ii. p. 76.

Type (fixed here) = *Carabus decorus* Fabricius, 1801.

Note 1.—The genus was proposed for *Carabus decorus* F., but *Carabus festinans* F., 1801, was also mentioned.

Note 2.—Hope selected as type *Calleida fasciata* Dej., 1831, but as that species was not one of those mentioned by the authors of the genus, the fixation is invalid.

CALLISTOMIMUS.

Chaudoir, 1872, Bull. Soc. Nat. Mosc. xlv. 1, p. 382.

Type (fixed here)=*Callistus quadripustulatus* Gory, 1833, the first described of the species enumerated.

COLEOLISSUS.

Bates, 1892, Ann. Mus. Civ. Gen. xxxii. p. 338.

Type (fixed here)=*Hypolithus perlucens* Bates, 1878.

Note 1.—Although he put forward *Coleolissus* as a subgenus of *Hypolithus* (=*Hyparpalus*), Bates writes, after enumerating some of the characters of his *C. lamprotus*, "the species seems to me sufficiently distinct to form a genus separate from *Hypolithus*." In either case it is desirable that a genotype should be fixed.

Note 2.—Four new species were described in the memoir cited above, but the earlier *H. perlucens*, also described by Bates, is referred to as belonging to "the group," and it has been selected as genotype.

CREPIDOGASTER.

Boheman, 1848, Ins. Caffr. i. p. 68.

Type (fixed here)=*Aptinus infuscatus* Dejean, 1825, the first described of the two species mentioned.

CYMBIONOTUM.

Baudi, 1864, Berl. Ent. Zeitschr. viii. p. 211.
Andrewes, 1933, Trans. Roy. Ent. Soc. Lond. lxxxi. p. 3.
Andrewes, 1935, Faun. Brit. Ind. Col. Carab. ii. p. 19.

Type (monotypic)=*Cymbionotum collare* Baudi, 1864 (=*Coscinia semelederi* Chaudoir, 1851).

Note.—In my 'Fauna of British India' volume, quoted above, the type was fixed as *Siagona schüppeli* Dejean, 1825, but as this species was not mentioned the selection is invalid.

DELTOMERUS.

Motchulsky, 1850, Käf. Russl. t. x.

Type (fixed here)=*Platynus elongatus* Dejean, 1831.

Note.—Five species were enumerated by the author, one of which, *D. longipennis* Motch., was apparently never described, and of the remaining four, Dejean's species, the first to be described, has here been selected as genotype.

DENDROCELLUS.

Schmidt-Goebel, 1846, Faun. Col. birm. p. 24.
Hope, 1831, Zool. Misc. p. 21.
Hope, 1838, Col. Man. ii. pp. 97 and 105.

Type (fixed here) =*Dendrocellus discolor* Schmidt-Goebel, 1846 (=*Desera nepalensis* Hope, 1831).

Note 1.—In 1831 Hope devoted a few words to the description of an Indian species with pectinate claws under the name of *Desera nepalensis*, the genus *Desera* not having at that time been described. In 1838 he described this genus in four lines, without, however, referring to the principal character which distinguishes it from *Drypta*, namely, the pectination of the claws. A few pages earlier he fixed the type of *Desera* as [*Cicindela*] *cylindricollis* F., 1798 (=*Carabus distinctus* Rossi, 1792), a species of *Drypta*, a genus in which the claws are not pectinate. In view of these very irregular arrangements *Desera* appears to fall into synonymy with *Drypta*, and *Dendrocellus* should take its place. This is not a matter of any moment, for the name of *Dendrocellus* had long been in use, until in 1912 Dupuis re-introduced *Desera*.

Note 2.—In Winkler's catalogue the name used is *Dendrocellus*, but in Csiki's and my own catalogues it appears as *Desera*, as it does also in my key to the Indian species (1936, Proc. Roy. Ent. Soc. Lond. B, v. p. 136).

DIPLOCHEILA.

Brullé, 1834, in Audouin et Brullé, Hist. Nat. Ins. iv. p. 407.

Type (monotypic) =*Carabus politus* Fabricius, 1792.

Synonym.—*Rembus* Dejean, 1826 (*nec* Germar, 1824).

Note 1.—In Csiki's catalogue the genus appears under the name *Rembus*, 1817, Latreille, in Cuvier's Règne Anim. (presumably vol. 4); no page is mentioned, so that, like me, the author of the catalogue has evidently been unable to discover the reference, and why it has been introduced I do not know. Following this is a second reference, viz., Latreille et Dejean, 1822, Hist. Nat. Ic. Col. Eur. p. 85, but here the name is cited only in the vernacular form as "Rembe," so that this, too, is inadmissible.

Note 2.—The name has frequently been used in the past under the altered form *Diplochila*.

DISCHISSUS.

Bates, 1873, Trans. Ent. Soc. Lond. p. 243.

Type (fixed here) = *Dischissus mirandus* Bates, 1873.

Note.—After describing his new species, *D. mirandus*, Bates added the name of an earlier one, *Peronomerus quadrinotatus* Motch., 1864, of which he had evidently not seen the type, and which, although it belongs to the genus, he misidentified. Bates evidently founded the genus on his own species, which has accordingly been made the genotype.

DISPHERICUS.

G. R. Waterhouse, 1842, Trans. Ent. Soc. Lond. iii. p. 211.

Type (monotypic) = *Dísphericus gambianus* G. R. Waterhouse, 1842.

Note.—The genus has only been mentioned here to draw attention to the spelling of the name, which has hitherto been erroneously transcribed as *Disphaericus*.

EURYAPTUS.

Bates, 1892, Ann. Mus. Civ. Gen. xxxii. p. 355.

Type (fixed here) = *Euryaptus nigellus* Bates, 1892, the first of the three species described.

FOUQUETIUS.

Maindron, 1906, Bull. Soc. Ent. Fr. p. 252.

Type (fixed here) = *Abacetus ferrugineus* Chaudoir, 1869.

Synonym.—*Holconotus*, Chaudoir, 1876 (*nec* Agassiz, 1854, nec Förster, 1862).

Note 1.—The species was figured by Schmidt-Goebel in 1846 (Faun. Col. birm. t. 2, f. 6) and the name *Holconotus ferrugineus* appeared on the cover, but there was no printed description. Chaudoir in 1869 first described the species under the genus *Abacetus* (Bull. Soc. Nat. Mosc. 42, 1, p. 399), and in 1876 described the genus *Holconotus* (Rev. Mag. Zool. (3), 4, p. 352) together with a new species, *H. rufus*, which he compares with *ferrugineus*. The name *Holconotus*, however, had meanwhile been used elsewhere, and Maindron proposed the new name *Fouquetius* to replace it.

Note 2.—Tchitcherin, in his key to the species of the genus (1898, Ann. Soc. Ent. Belg. 42, p. 453), makes use of the expression "Espèces d'Asie (type : *H. ferrugineus* Chaud.)," but this does not seem intended as the selection of a genotype.

Note 3.—In Csiki's catalogue the *ferrugineus* of Schmidt-Goebel *in litt.*, and that of Chaudoir are, without apparent justification, treated as separate species, and a new specific name is proposed for the latter.

HARPAGLOSSUS.

Motchulsky, 1858, Études Ent. vii. p. 173.

Type (fixed here)=*Feronia lævigata* Dejean, 1828, the first of the four species mentioned by Chaudoir, and the earliest to be described.

Synonyms.—*Ceroglossus* Chaudoir, 1856 (*nec* Solier, 1848). *Penthimus*, Gemminger and Harold, 1868.

Note.—Both *Harpaglossus* and *Penthimus* were merely new names, proposed to take the place of Chaudoir's *Ceroglossus*, but Motchulsky's was the earlier of the two.

MECYCLOTHORAX.

Sharp, 1903, Faun. Hawaii, iii. p. 243.

Type (fixed here)=*Cyclothorax montivagus* Blackburn, 1878, Ent. Month. Mag. 15, p. 122.

Note.—About two-thirds of the species of this considerable genus are found in Hawaii, and the genotype has been selected after consultation with Mr. E. C. Zimmerman, of the Bishop Museum, Honolulu.

MENARUS.

Jedlička, 1934, Sborn. Ent. Odd. Nár. Mus. Prace, xii. p. 122.

Type (fixed here)=*Menarus borneensis* Jedlička, 1934, the first of the three species described.

MICROCOSMUS.

Chaudoir, 1878, Ann. Soc. Ent. Belg. xxi. p. 139.

Type (fixed here)=*Panagaeus cruciatus* Dejean, 1831, the first to be described of the species included by Dejean in the genus *Panagaeus*, and placed by Chaudoir, along with others, in his new genus.

MOCHTHERUS.

Schmidt-Goebel, 1846, Faun. Col. birm. p. 76.

Type (fixed here)=*Mochtherus angulatus* Schmidt-Goebel, 1846 (=*Dromius tetraspilotus* Macleay, 1825).

Note.—Of the two species described by Schmidt-Goebel, the second, *M. rotundatus*, has long since been transferred to the genus *Dolichoctis*.

OESYPARUS.

Andrewes, 1923, Ann. & Mag. Nat. Hist. (9) xii. p. 444.

Type (fixed here)=*Oesyperus unctulus* Andrewes, 1923.

OMPHRA.

Reiche, 1842, Ann. Soc. Ent. Fr. xi. p. 330.

Type (fixed here)=*Galerita hirta* Fabricius, 1801.

Note.—Five species were mentioned, of which *O. hirta*, the first on the list and the earliest to be described, has been selected as genotype.

OPHIONEA.

Klug, 1821, Ent. Braz. Spec. p. 298.
Eschscholtz, 1829, Zool. Atl. ii. p. 5 (*Ophionaea*).
Andrewes, 1919, Ann. & Mag. Nat. Hist. (9) iii. p. 475.

Type (fixed by Eschschotz)=*Cicindela cyanocephala* Fabricius, 1798 (=*Attelabus indicus* Thunberg, 1784).

Note.—Three species were named, viz., *pennsylvanica*, *cyanocephala*, and *surinamensis*. Of these *surinamensis* is the type of the genus *Colliuris* Degeer, 1774, and *pennsylvanica* belongs to the same genus. There remains only *Cyanocephala*, which differs from the other two species in having a bilobed fourth tarsal joint, and this character was made use of by Eschscholtz in differentiating various genera in the paper cited above. In effect, *cyanocephala*, although not named, was there made the genotype.

OPHONISCUS.

Bates, 1892, Ann. Mus. Civ. Gen. xxxii. p. 337.

Type (fixed here)=*Ophoniscus iridulus* Bates, 1892, the first of the three species described.

OXYLOBUS.

Chaudoir, 1855, Bull. Soc. Nat. Mosc. xxviii. 1, p. 5.

Type (fixed here)=*Scarites lateralis* Dejean, 1825, the earliest to be described of the three species included by Chaudoir in his genus.

Note.—In my 'Fauna of British India' (1929, Carabidæ, 1, p. 292) *Scarites porcatus* F., 1798, was selected as genotype, an invalid selection, as this species was not among those mentioned by Chaudoir.

PENTAGONICA.

Schmidt-Goebel, 1846, Faun. Col. birm. p. 47.

Type (fixed here)=*Pentagonica ruficollis* Schmidt-Goebel, 1846, the first of the two species described.

PLATIA.

Chaudoir, 1869, Ann. Soc. Ent. Belg. xii. p. 155.

Type (fixed here)=*Platia lineella* Chaudoir, 1869, the first in order of the three species described.

PLATYMETOPUS.

Dejean, 1829, Spec. Gén. Col. iv. p. 68.
Hope. 1838, Col. Man. ii. p. 88.

Type (fixed by Hope)=*Platymetopus vestitus* Dejean, 1829.

Note.—In Hope's work the name appears as *P. notitus* Dej.. apparently a misprint for *vestitus*, one of the eight species named, which, like the alleged *notitus*, was said to come from Senegal. The specific name *notitus* is unknown among the Carabidæ and seems to be meaningless. Hope's MSS. are not at present available for examination, but Prof. Hale Carpenter informs me that there is a specimen of *P. vestitus* in the collection, bearing a label in Hope's writing. a fairly strong confirmation of the above suggestion. Should any doubt remain, *P. vestitus* is here formally selected as the genotype.

SERRIMARGO.

Chaudoir, 1869, Ann. Soc. Ent. Belg. xii. p. 134.

Type (fixed here)=*Thyreopterus guttiger* Schaum, 1860, the earlier to be described of the two species cited.

SIMOUS.

Chaudoir, 1882, Ann. Soc. Ent. Fr. (6), ii. p. 373.

Type (fixed here)=*Oodes nigriceps* Wiedemann, 1821, the first described of the four species enumerated.

STYPHLOMERUS.

Chaudoir, 1876, Ann. Soc. Ent. Belg. xix. p. 87.
Putzeys, 1875, Compt. rend. Soc. Ent. Belg. xviii. p. iv.

Type (fixed here)=*Brachinus quadrimaculatus* Dejean, 1831.

Note.—The MS. of Chaudoir's 'Monographie des Brachynides' was offered in 1875 to the Belgian Entomological Society for publication, and Putzeys was asked to report upon it. This he did at some length, pointing out, among other things, how *Styphlomerus* was to be differentiated from the other genera of the group. In effect he was quoting from Chaudoir's work, so that, although his report appeared before the monograph was published, Putzeys can hardly be regarded as the author of the genus. The species selected as genotype is the first to be described by Dejean, and is one of those mentioned both by Chaudoir and Putzeys.

SYSTOLOCRANIUS.

Chaudoir, 1857, Bull. Soc. Nat. Mosc. xxx. 2, p. 23.

Type (fixed here)=*Oodes grandis* Dejean, 1826 (=*Oodes linea* Wiedemann, 1821), the earliest to be described of the four species enumerated.

TILIUS.

Chaudoir, 1876, Bull. Soc. Nat. Mosc. li. 2, p. 71.

Type (fixed here)=*Dromius obscurellus* Dejean, 1831, the first of the three species cited.

TRICHIS.

Klug, 1832, Symb. Phys. Decas, iii. t. 21.

Type (fixed here)=*Trichis pallida* Klug, 1832, the first of the two species described.

TRIGONOTOMA.

Dejean, 1828, Spec. Gen. Col. iii. p. 182.
Brullé, 1834, in Audouin et Brullé, Hist. Nat. Ins. iv. p. 333.
Hope, 1838, Col. Man. ii. p. 111.
Chaudoir, 1868, Ann. Soc. Ent. Belg. xi. p. 158.

Type (fixed by Hope) = *Trigonotoma viridicollis* Dejean, 1828 (nec Macleay, 1825) (= *Trigonotoma indica* Brullé, 1834).

Note 1.—Two species were described, *viridicollis* and *planicollis*. Of these, *planicollis* belongs to Dejean's own genus *Lesticus*, described a few pages after *Trigonotoma*. The other was supposed by Dejean to be identical with *Omaseus viridicollis* Macleay, 1825, from Java, but in fact was the same species as Brullé's *indica*. These facts were first established by Chaudoir in his "Révision des Trigonotomides," and having seen all the types, I can confirm what he says.

Note 2.—Hope fixed the type as *Omaseus viridicollis* Macleay, evidently following Dejean's misidentification, subsequently rectified by Chaudoir.

NOTE.

The following new generic names are proposed to take the place of others which are now found to be preoccupied :—

ALLOPHANES nom. nov. for ALLOGENES Andrewes, 1931, Zool. Med. xiv. p. 74 (*nec* Gude, 1911).

NESITES nom. nov. for ALOMA Andrewes, 1931, Journ. Fed. Malay Mus. xvi. p. 449 (nec Hoernes and Auinger, 1891).

TRICHOMOLOPS nom. nov. for AMOLOPS Tchitcherin, 1898, Abeille, xxix. p. 107 (*nec* Cope, 1865). In the text the genus appears under its original name.

XV.—*New* Staphylinidæ (*Col.*) *from New Guinea.*

By MALCOLM CAMERON, M.B., R.N., F.R.E.S.

Priochirus (*Plastus*) *cheesmanianus*, sp. n.

Build of *antennarius* Fauv. but larger (20 mm.), the penultimate joints of the antennæ longer, the frontal impression narrower, the frontal horns longer and more divergent, the outer tooth sharper and more separated from the horn. Nearer *papuanus* Cam. but larger, the antennæ longer, all the joints longer than broad, the penultimate only slightly so in the ♂; the frontal impression is similar in the two species, but the frontal horns are more divergent, the external tooth larger, the postocular region more closely and strongly punctured, the thorax broader and more convex, the sides much more closely punctured; in other respects similar.

Cyclops Mts.: Mt. Lina, altitude 3500 feet, iii. 1936.

Oxytelus (*Anotylus*) *kokodanus*, sp. n.

Shining, head ferruginous red, thorax and abdomen yellow, elytra smoky brown. Antennæ and legs reddish yellow.

Length 1·75–2 mm.

♀. In build and lustre scarcely differing from *lewisius* Shp., and except for the darker elytra and entirely reddish-yellow antennæ similar in colour; it is, however, smaller, the depressed clypeal region distinctly coriaceous although shining, the punctures on the basal region of the head are fewer and smaller, the antennæ more slender but similarly constructed. Thorax transverse (3·5 : 2·5), trapezoidal, the median sulcus narrow and deep, the lateral absent, at the sides distinctly impressed, the puncturation very like that of *lewisius*, not striate. Elytra slightly longer than the thorax, coarsely punctate-striate, much less finely than in *lewisius*. Abdomen with very indistinct ground-sculpture, extremely finely and sparingly punctured, each puncture with a minute yellow hair.

♂. Unknown.

Kokoda: altitude 1200 feet, x. 1933.

Stenus (*Hypostenus*) *virideus*, sp. n.

Shining, green, the head bluish green, the last abdominal segment blackish. Antennæ, palpi, and legs reddish yellow, the apices of the femora very narrowly and obscurely infuscate.

Length 6·75 mm.

Of more robust build than *cœlestis* Fauv. and of a green colour, with much more strongly punctured abdomen, longer antennæ, and differently shaped head resembling that of a *Dianous*, the postocular region being well developed and obliquely truncate to the neck. Head a little broader than the base of the elytra, excavated between the eyes, in the middle with a slightly raised, small, impunctate space, elsewhere with moderately fine punctures closer than in *cœlestis*, the front with a few hairs only. Antennæ long and slender, reaching the middle of the elytra. Thorax a half longer than broad, the sides feebly rounded before the middle, straighter and a little retracted behind, not quite so coarsely but more closely punctured than in *cœlestis.* Elytra slightly longer and a half broader than the thorax, the puncturation coarser but not so close. Abdomen narrow and elongate, the bases of the first four visible segments strongly constricted, a little more finely and a little less closely punctured than the thorax on the first four visible segments, the penultimate segment much more finely and much more sparingly, the last almost impunctate. Except for a few yellow hairs on the frontal region of the head almost glabrous, and without ground-sculpture except on the last two tergites.

♂. 6th ventral segment with a deep triangular excision, its apex rounded ; 3rd with a stout curved spine on each side directed downwards, backwards, and a little outwards (its apex just visible from above), the space between flattened.

Mt. Tafa, altitude 8550 feet, iii. 1934.

Stenus (*Hypostenus*) *cheesmani*, sp. n.

Shining, head and thorax blue, elytra and abdomen green, the last segment black. Antennæ, palpi, and legs reddish yellow, the femora scarcely infuscate at apex.

Length 6·5 mm.

In antennal structure scarcely differing from *cœlestis* Fauv. but a little more robust and with green elytra and abdomen and different ♂ characters, etc. The head is more finely and sparingly punctured than in that species, the front also is not closely pubescent as in *cœlestis*, but is only furnished with a few scattered hairs; the thorax is more finely punctured and the elytra a little less closely punctured than in that species, the abdomen as sparingly but not quite so finely punctured, the last two segments with distinct coriaceous ground-sculpture, whereas in *cœlestis* the last segment only is feebly coriaceous.

♂. 2nd sternite flattened along the middle and closely pubescent, the posterior border feebly, broadly, arcuately emarginate; 3rd broadly, semicircularly and more deeply impressed, closely pubescent, the side-margins of the impression carinate, the posterior border arcuately emarginate; 4th like the preceding but with deeper impression and more strongly carinate margins; 5th flattened along the middle and less pubescent than the preceding; 6th deeply triangularly excised, the apex of the excision rounded.

Mt. Tafa: altitude 8500 feet, ii. 1934.

Stenus (*Hypostenus*) *cheesmanianus*, sp. n.

Shining, blue or violet, the last two abdominal segments black. Antennæ, palpi, and legs reddish yellow, the apices of the femora scarcely infuscate.

Length 6·5 mm.

In build and antennal structure similar to *cheesmani* Cam. but of the colour of *cœlestis* Fauv. Head as in *cheesmani*, the thorax a little more coarsely and more closely punctured, the elytra a little more closely punctured than in that species, that of the abdomen as in *cheesmani*, but all the segments with a fine but distinct coriaceous ground-sculpture.

♂. 3rd sternite lightly subtriangularly impressed in the middle for most of its length, the posterior border feebly, broadly emarginate, the impression more pubescent; 4th deeply impressed, the sides of the impression carinate, more closely pubescent than the 3rd, broadly and slightly emarginate behind; 5th flattened along the middle; 6th deeply triangularly emarginate, the apex of the emargination rounded.

Mt. Tafa: altitude 8500 feet, ii. 1934. Mondo: altitude 5000 feet, i. 1934.

Key to the Species.

1.	Clypeal region closely pubescent. Colour blue; abdomen without ground-sculpture except on the last two segments	*cœlestis* Fauv.
	Clypeal region with only a few scattered hairs	2.
2.	Head broader than the base of the elytra; antennæ very long, reaching the middle of the elytra; puncturation of abdomen sparing but coarser, ground-sculpture feeble	*virideus* Cam.
	Head not broader than the base of elytra;	

	antennæ shorter; puncturation of abdomen finer, as in *cœlestis*	3.
3.	Last two segments of abdomen black, with ground-sculpture throughout; the rest of the insect blue or violet; thorax a little more coarsely and closely punctured . . .	*cheesmanianus* Cam.
	Last segment only of abdomen black, with ground-sculpture only on the last two segments; head and thorax blue, elytra and abdomen green; thorax a little less coarsely and a little less closely punctured.	*cheesmani* Cam.

Thinocharis papuana, sp. n.

Head and thorax greasy lustrous, pitchy-black; elytra more shining yellowish red, abdomen reddish brown. Antennæ and legs reddish yellow.

Length 2 mm.

In size and build very like *carinicollis* Kr., but with darker head and thorax and more reddish elytra; the head is closely and very finely but more distinctly punctured than in that species, very finely coriaceous; antennæ similar. Thorax a little narrower than in *carinicollis*, with distinct smooth shining median line and very finely, closely and roughly punctured as in that species, the elytra and abdomen scarcely differing in sculpture and pubescence from *carinicollis*.

Mt. Sabron: altitude 930 feet, vi. 1936. Unique.

Stilicopsis interocularis, sp. n.

Shining, reddish yellow, the head between the eyes with transverse blackish spot. Antennæ and legs reddish yellow.

Length 3·5 mm.

In the shape of the head and antennal structure like *setigera* Shp., the colour likewise the same except for the interocular spot; it is, however, a little larger, the reticulate sculpture of the head and thorax finer, the meshes more elongate especially at the base of the former, moreover the thorax is as long as broad. Elytra a little longer than the thorax, as long as broad, more closely and more finely punctured than in *setigera*, the sculpture of the abdomen scarcely differing from that species. From *unicolor* Cam. it differs in the larger head, with more elongate reticulate sculpture, the slightly longer thorax with rounded posterior angles but with similar sculpture, the elytra a little shorter and less finely punctured.

♂. Unknown.

Cyclops Mts.: Sabron, altitude 1200 feet, vi. 1936. Unique.

Medon (s. str.) *cyclopius*, sp. n.

Shining, head and thorax bright, abdomen darker red; elytra pitchy black, the posterior fourth yellowish red. Antennæ and legs reddish yellow.

Length 3 mm.

Head quadrate, as long as broad, slightly wider than the thorax, the eyes rather small, the postocular region slightly retracted, the posterior angle rounded, the whole surface rather closely covered with moderate umbilicate punctures and without ground-sculpture. Antennæ slender, reaching the middle of the thorax, the 3rd joint as long as the 4th, a little longer than the 2nd, 5th and 6th shorter, decreasing in length, 7th as long as broad, 8th to 10th slightly transverse. Thorax slightly transverse, the sides gently rounded, equally retracted in front and behind, all the angles rounded; along the middle with moderately broad smooth space, elsewhere with puncturation as on the head and without ground-sculpture. Elytra a little longer than the thorax, less coarsely, less closely, and less deeply punctured. Abdomen finely, moderately closely punctured on the anterior, much more sparingly on the posterior segments, and with long rather coarse pubescence especially at sides and apex. Pubescence of the fore parts very fine and scanty.

♂. Unknown.

Cyclops Mts.: Sabron, altitude 930–1200 feet, vi. 1936.

Scopæus kokodanus, sp. n.

Moderately shining black, the posterior seventh of the elytra reddish yellow. Antennæ reddish yellow, the first four or five joints infuscate. Legs reddish yellow, the femora infuscate.

Length 4·5 mm.

Colour of *montalbensis* Bernh., but larger, with longer, pyriform head, longer antennæ, longer, more finely, and not at all roughly punctured elytra. Head longer than broad, pyriform, the postocular region long and gently rounded and retracted to the neck, extremely finely, closely punctured. Antennæ with all the joints longer than broad, decreasing in length, the penultimate only slightly longer than broad. Thorax longer (6 : 4·5) than broad, oval, widest about the middle, before the scutellum with small transverse impression, in front with a fine median keel which continues as a very fine impressed line for a short distance ; sculpture as on the head. Elytra broader and a little longer than the thorax, with similar puncturation. Abdomen rather less finely and more closely punctured than the fore parts. The whole insect closely covered with a fine short greyish pubescence.

♂. Unknown.

Kokoda : altitude 1200 feet, vi.–vii. 1933. Unique.

Thyreocephalus splendens, sp. n.

Shining ; head and thorax bright golden coppery, the former here and there with greenish reflex. Scutellum black. Elytra bright blue with violet-purple reflex. Abdomen black, the last segment and posterior margin of the preceding reddish yellow. Antennæ reddish brown, the last three joints yellow. Legs reddish.

Length 12 mm.

In size, build, and antennal structure similar to *albertisi* Fauv., but differs in the colour, serially punctured elytra, and the much finer and more sparing abdominal puncturation. The head, except for the usual post-ocular and basal punctures, is without the fine scattered puncturation seen in *albertisi*, such punctures as are present being scarcely visible and much more sparing; the frontal region also is quite smooth, without trace of the fine striæ seen in that species ; the thorax likewise has only a few scarcely visible punctures. The elytra have each a sutural and lateral series of punctures and also a row on the reflexed side, elsewhere practically impunctate. The abdomen finely and rather sparingly punctured.

Cyclops Mts. : Mt. Lina, altitude 3500 feet, iii. 1936. Unique.

Diochus papuanus, sp. n.

Entirely black, the fore parts shining, the abdomen duller. Antennæ and legs reddish yellow.

Length 4·75 mm.

In the build of the head and thorax similar to *antennatus* Motsch., but differs in the shorter elytra, which are a fifth shorter than the thorax, and the longer antennæ, the 3rd to 7th joints longer than broad, decreasing in length, the 8th to 10th as long as broad. The elytra have each two rows of five very fine setiferous punctures, one along the suture the other subhumeral, the reflexed sides also with five or six others. The abdomen closely and finely punctured and pubescent.

♂. 6th ventral segment rather broadly, deeply, arcuately emarginate.

Kokoda : altitude 1200 feet, ix. 1933. Unique.

Philonthus cyclopius, sp. n.

Head and abdomen black; thorax dark red, with dorsal series of four punctures, here and there with sericeous reflex; elytra obscure purplish blue, with the shoulders and postero-external angles greenish. Antennæ black, the last three joints yellow. Legs yellowish red.

Length 11 mm.

♀. Head a little transverse, subquadrate, as broad as the thorax, the eyes large, the postocular region rounded and with a few small punctures; interocular series absent, only a single puncture at the inner margin of the eye present. Antennæ long and slender, all the joints longer than broad, decreasing in length, the penultimate only slightly longer than broad. Thorax slightly longer than broad, the sides nearly straight and a little retracted behind, with a dorsal row of four moderate punctures, the first of them remote from the 2nd, externally with three others; besides the usual ground-sculpture with minute scattered punctures. Scutellum black, closely covered with yellow hairs. Elytra a little longer and broader than the thorax, finely, moderately closely punctured and with long black hairs, at the shoulders and sides with longer black setæ. Abdomen moderately closely, more coarsely punctured than the elytra, more sparingly on the last two semgents, the pubescence long, black, and coarse, the sides and apex with longer black setæ.

Cyclops Mts.: Mt. Lina, altitude 3500–4500 feet, iii. 1936. Unique.

Acylophorus breviceps, sp. n.

Shining, black. Antennæ black, the basal half of the 1st joint reddish yellow. Legs pitchy, the tars reddish yellow.

Length 6 mm.

Distinguished by the rather broad subtriangular head, which is slightly broader than long, widened and rounded behind the large eyes, the middle impunctate, at the base with a transverse somewhat irregular row of small punctures, the postocular region closely and finely punctured and pubescent, on each side of the middle with a longitudinal row of about ten punctures; ground-sculpture absent. Antennæ with the 3rd joint a little shorter than the 2nd, 4th a little shorter than the 3rd, 5th to 7th as long as but stouter than the 4th, a little longer than broad and differing but little, 8th to 10th gradually more transverse. Thorax slightly transverse (4 : 3·5), the sides gently rounded and a little more retracted in front, on the middle of the disc with a pair of punctures and two others nearer the anterior angles. Elytra broader and a little longer (5 : 4) than the thorax, rather closely and roughly punctured and pubescent. Abdomen moderately closely, much more finely punctured than the elytra, and with rather long grey pubescence.

Cyclops Mts.: Sabron, altitude 930 feet, iv. 1936. Unique.

Ousilusa kokodana, sp. n.*

Moderately shining; the fore parts ferruginous red, the elytra more or less extensively infuscate postero-externally; abdomen yellowish red, the 6th segment blackish. Antennæ reddish, the last joint lighter. Legs reddish yellow.

Length 2·75 mm.

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* The genus *Ousilusa* has the mouth-parts as in *Diestota*, but is distinguished by the mesosternum being without a keel.

In size, build, and antennal structure like *Diestota testacea* Rey, but less shining and of a darker red colour, more closely punctured head and thorax, more closely and less finely punctured elytra, the abdomen much more closely punctured on the anterior segments, the eyes larger. Head strongly transverse, suborbicular, narrower than the thorax, the eyes large; rather finely, closely punctured, and without ground-sculpture. Antennæ rather stout, the 3rd joint a little longer than the 2nd, 4th scarcely transverse, 5th to 10th gradually increasing in width, the penultimate quite twice as broad as long; 11th rather longer than the 9th and 10th together, parallel-sided, with rounded apex. Thorax transverse (4·3 : 3), convex, the sides rounded in front, straight and retracted behind, before the scutellum with a transverse impression, along the middle in front with a feeble impressed line, puncturation as on the head. Elytra a little broader and a third longer than the thorax, closely and rather finely punctured, with traces of larger obsolete punctures at the sutural and external regions. Abdomen rather coarsely and closely punctured in the impressions, more finely and sparingly elsewhere, very sparingly on the last two segments.

♂. Unknown.

Kokoda: altitude 1200 feet, x. 1933. Unique.

Cœnonica rufotestacea, sp. n.

Shining, yellowish red. Antennæ black, the first four joints and legs reddish yellow.

Length 1·5 mm.

Near *rufa* Cam., of the same size but narrower, the elytra not at all infuscate, the puncturation of the head not so deep and close; the antennæ are similarly constructed, the penultimate joints very short and broad, about three times broader than long. Thorax strongly transverse (2·75 : 1·75), the posterior angles obtuse, with similar transverse basal impression which is closely punctured, and with two short nearly parallel ones which with it forms a **U**; in front with a short impressed median line, the puncturation sparing, finer than in *rufa*. Elytra longer (2·5 : 1·75) and broader than the thorax, transverse, the puncturation finer, closer, and rougher than in *rufa*. Abdomen rather closely and coarsely punctured in the impressions, almost impunctate elsewhere, and without the elongate rugæ seen in *rufa*.

♂. Unknown.

Kokoda : altitude 1200 feet, ix. 1933. Unique.

Mimomalota papuana, sp. n.

Greasy lustrous ; head black, thorax dark red, elytra pitchy, the base more or less reddish, abdomen more shining, yellowish red, the 6th segment scarcely infuscate. Antennæ and legs reddish yellow.

Length 1·5 mm.

Size and build of *variventris* Kr., but with dark red thorax and dark elytra, the head much more deeply and distinctly punctured, antennæ a little shorter, the penultimate joints more transverse. Colour, build, and lustre of *minuta* Cam., but larger and more robust, antennæ a little longer and stouter, the 4th to 6th joints not transverse ; the puncturation of the head is similar, that of the thorax much less distinct. Head closely and deeply punctured, obscuring the ground-sculpture. Antennæ with the 3rd joint as long as the 2nd, 4th to 6th scarcely longer than broad, 7th to 10th transverse, 11th as long as the 9th and 10th together. Thorax transverse (2·5 : 2), the sides gently rounded in front, straighter and more retracted behind, the posterior angles obtuse, along the middle broadly superficially impressed, densely coriaceous, the puncturation scarcely visible. Elytra broader but scarcely longer than the thorax, closely punctured, the punctures less fine than in *variventris*. Abdomen finely, rather closely punctured on the anterior segments (but less closely than in *variventris*), more sparingly behind. The whole insect finely and rather closely pubescent.

♂. Unknown.

Kokoda : altitude 1200 feet, iiix. 1933. Unique.

Atheta (*Acrotona*) *cheesmani*, sp. n.

Rather shining, reddish yellow, the elytra about the middle externally infuscate. Antennæ reddish yellow, slightly infuscate from the 5th joint. Legs reddish yellow.

Length 2 mm.

In size and build scarcely differing from *annuliventris* Kr., the lustre, ground-colour, and antennæ similar, but the abdomen is uniformly coloured and the elytra infuscate externally. Head transverse, less finely and rather more closely punctured than in *annuliventris*. Antennæ with the 3rd joint a little shorter than the 2nd, 4th as long as broad, 5th to 10th gradually more transverse, the penultimate about twice as broad as long. Thorax convex, transverse (3·75 : 2·5), closely and finely punctured as in *annuliventris*. Elytra as long as the thorax, closely, less finely, and more roughly punctured than in *annuliventris*, abdomen less closely, more roughly punctured than in that species, with long, rather coarse pubescence, the puncturation much more sparing on the last three segments, the sides and apex with black setæ. The fore parts with fine short yellow hairs.

Cyclops Mts.: Sabron, altitude 1200 feet, 15. v. 1936.

Orphnebius (*Mesocephalobius*) *papuanus*, sp. n.

Shining black, the sutural region of the elytra very narrowly and obscurely reddish. Antennæ black, the 2nd joint red. Femora yellow, their apices narrowly blackish; tibiæ and tarsi reddish.

Length 5·75 mm.

Build of *bakeri* Bernh., but much larger and differently coloured. Head strongly transverse, oval, narrower than the thorax (7 : 9), the eyes large, almost as long as the postocular region, with a few very fine scattered punctures and without ground-sculpture. Antennæ moderate, the 3rd joint a little longer than the 2nd, 4th longer than broad, 5th as long as broad, 6th to 10th gradually more transverse, the penultimate about a half broader than long, 11th as long as the 9th and 10th together. Thorax transverse (3 : 2), convex, the sides nearly straight, but little retracted behind, the angles rounded, a little behind the middle of the disc with a pair of small punctures, elsewhere with a few very small scattered punctures as on the head. Elytra broader and longer (4 : 3) than the thorax, the disc of each broadly and superficially impressed, moderately finely, asperately, and not very closely punctured. Abdomen a little narrowed at the base, more strongly towards the apex, somewhat scaphoidal, the lateral margins broad and flattened, the anterior segments scarcely perceptibly and very sparingly punctured, the 7th with a little keel on each side and closely and coarsely punctured, the 8th with a few small punctures, its posterior margin gently rounded.

Mt. Nomo: altitude 700 feet, ii 1936.

TROPOSANDRIA, gen. nov.

In build resembling the larger species of South American *Hoplandria* Kr. (*bicallosa* Bernh., etc.), but at once distinguished from this genus by the long 1st joint of the posterior tarsi, which is nearly twice as long as the 2nd moreover, the mesosternum is distinctly keeled throughout, its process broad and extending nearly the whole length of the coxæ (which are widely separated) and deeply arcuately emarginate at its apex, receiving the bluntly pointed metasternal process. The temples are strongly bordered below, the maxillary palpi as in *Hoplandria*; the structure of the rest of the mouth-parts, which are not visible in the unique type, is unknown.

Troposandria papuana, sp. n.

Shining, black, the abdomen dark red, each elytron with a dull reddish spot extending obliquely from about the middle to the postero-internal angle. Antennæ with the first five joints reddish yellow, the rest black. Legs pitchy black, the tarsi yellow.

Length 4 mm.

♂. In build much resembling *Hoplandria bicallosa* Bernh. Robust, head strongly transverse, narrower than the thorax, the eyes longer than the rounded postocular region; with extremely fine scattered punctures, more numerous towards the base; ground-sculpture absent. Antennæ long and slender, but little thickened towards the apex, the 3rd joint longer than the 2nd, 4th and following all much longer than broad, decreasing in length and furnished with long black hairs, the 10th about a half longer than broad, the 11th shorter than the 9th and 10th together. Thorax convex, transverse (3·75 : 2·75), the sides gently rounded, more retracted in front, the angles rounded, the puncturation as on the head but less sparing. Elytra broader and longer (3·3 : 2·75) than the thorax, each broadly triangularly impressed in the posterior half, in the middle of the impression with a small tubercle, the postero-internal angle furnished with a sharp curved ridge, the whole surface moderately finely, closely, subrugosely punctured. Abdomen scaphoidal, the lateral margins broad and flattened, the sculpture consisting of small elongate granules each with a hair, very scanty on the first two visible tergites, more numerous on the following; the first four visible segments with broadly arcuately emarginate posterior borders, the 5th with a strong median keel, the 6th absent. Sides and apex with long black setæ.

Mt. Cyclops: altitude 3500 feet, iii. 1936. Unique.

XVI.—*Some new Generic Names for Palæozoic Corals.*

By W. D. LANG, M.A., Sc.D., F.R.S., and STANLEY SMITH, M.A., D.Sc., F.G.S., Department of Geology, British Museum (Natural History).

[Plate IV.]

FIVE new generic names are here proposed for Palæozoic corals—four Rugose and one Tabulate species. Two replace the pre-occupied names *Acanthocyclus* Dybowski and *Rhysodes* Smith and Tremberth; two are proposed as new generic names for the species *Cyathaxonia dalmani* Edwards & Haime and *Alveolites fougti* Edwards & Haime, respectively; and the remaining new genus includes a new species from Canada.

RHABDOCYCLUS.

Rhabdocyclus, nom. nov. (ῥάβδος, a rod, because the septa are formed of rhabdacanths *; φύλλον, a leaf,

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* See Hill, 1936, p. 198.

i. e., a septum, the common termination for Rugose coral genera) for *Acanthocyclus* Dybowski, pre-occupied by *Acanthocyclus* Lucas in d'Orbigny, 1844, p. 29, for a Recent crustacean.

Genotype (genolectotype of *Acanthocyclus*, see Lang & Smith, 1927, p. 450)—*Palæocyclus fletcheri* Edwards & Haime, 1851, p. 205; 1855, p. 248, pl. lvii. figs. 3, 3 *a–f*. Silurian, Wenlock Limestone. Dudley, England.

CIRCOPHYLLUM.

Circophyllum, nom. nov. (*κίρκος*, a ring; *φύλλον*, a leaf, *i. e.*, a septum, the common termination for Rugose coral genera) for *Rhysodes* Smith & Tremberth, 1927, p. 309, pre-occupied by *Rhysodes* Illiger in Dalman, 1823, p. 93, for a coleopteron.

Genotype (genoholotype by authors' original designation of *Rhysodes* Smith & Tremberth)—*Rhysodes samsugnensis* Smith & Tremberth, 1927, p. 311, pl. vii. figs. 8–11. Upper Silurian, Horizon *f* of Lindström (=Ludlow). Samsugn in Othem, Gotland.

DALMANOPHYLLUM.

Dalmanophyllum, gen. nov. (J. W. Dalman, Swedish palæontologist; and *φύλλον*, a leaf, *i. e.*, a septum, the common termination for Rugose coral genera).

Genotype.—*Cyathaxonia dalmani* Edwards & Haime, 1851, p. 322, pl. i. fig. 6. Upper Silurian. Gotland.

Diagnosis.—Trochoid Rugose corals typically simple, with a deep calice, a large columella, elliptical in section and projecting above the calice floor, major septa typically dilated and laterally contiguous throughout the greater part of the corallite, feebly developed minor septa, widely spaced tabulæ, largely suppressed in the type-species by the contiguity of the septa, and no dissepiments.

Remarks.—*Cyathaxonia dalmani* is not congeneric with *C. cornu* Michelin, genotype of *Cyathaxonia* Michelin, 1847, p. 258 (see Edwards & Haime, 1850, p. lxv), nor with *Lindströmia columnaris* Nicholson & Thomson, 1876, p. 150 (figured Etheridge & Nicholson, 1878, p. 84, text-figs. 4 *b*, *b′*), genotype of *Lindströmia* Nicholson & Thomson, to which genus it was transferred by Etheridge & Nicholson, 1878, p. 84. It is possibly related, however, to *Tyria insertum* Scheffen, 1933, pl. v. figs. 2–3, genotype of *Tyria* Scheffen, 1933, p. 33, although *T. insertum* is a compound form. The name *Tyria* is pre-occupied by *Tyria* Huebner, 1822, p. 166, for a lepidopteron, and by *Tyria* Fitzinger, 1826, pp. 29, 60, for a reptile.

Lindström proposed the generic name *Centrotus* for *Cyathaxonia dalmani* (see J. Thomson & H. A. Nicholson, 1876, Ann. & Mag. Nat. Hist. ser. 4, vol. xvii. p. 128), though he does not appear to have published this. In any case *Centrotus* Lindström in Etheridge & Nicholson is pre-occupied by *Centrotus* Fabricius, 1803, p. 16, for a hemipteron.

PLANALVEOLITES.

Planalveolites, gen. nov. Planus, flat.

Genotype.—*Alveolites fougti* Edwards & Haime, 1851, p. 257, pl. xvii. figs. 5, 5 *a*. Silurian, Salopian. Gotland.

Diagnosis.—Tabulate corals which form thin, flat coralla of horizontal corallites with very oblique calices, the lower wall of which is typically produced considerably beyond the upper. The acanthine septa are typically well developed, numerous, but very short; the tabulæ are thin and distant; mural pores are large and far apart.

Remarks.—The name is here proposed for Favositid corals which form lamellar colonies of prostrate corallites. *P. fougti*, which has large corallites, differs markedly from the typical *Alveolites*, but the one genus grades into the other.

P. fougti forms thin sheets consisting of one, two, or at most three layers of sub-polygonal, almost horizontal corallites. The main characters of the species are those of the generic diagnosis, but the septa are mere rows of granulations on the inside of the corallite walls. The large and widely spaced mural pores are irregularly distributed.

MICTOPHYLLUM.

Mictophyllum, gen. nov. (μικτος, mixed, referring to the tabulæ; φύλλον, leaf, *i. e.*, a septum, the usual termination of Rugose coral genera).

Genotype.—*Mictophyllum nobile*, sp. n., Pl. IV. figs. 1 *a*, *b*. Upper Devonian, bed S. Gorge of the Redknife River, tributary of the Mackenzie River, N.W. Canada.

Diagnosis.—Simple trochoid, Rugose corals of large, or medium, size, in which the typically thin and unmodified septa reach, or nearly reach, the axis, but do not form an axial complex; and in which the tabular tissue is mainly represented by small, arched tabellæ arranged in concave floors, and not very clearly differentiated from the typically rather large, somewhat elongated dissepiments; but at some levels complete, or almost complete, nearly flat or sagging tabulæ are developed.

Remarks.—The holotype * of *M. nobile* (Pl. IV. figs. 1 *a*, *b*) is a large, nearly straight coral, proximally imperfect, but originally about 12 cm. long and 4·5 cm. wide at its distal end. There are approximately forty major septa, some of which extend to the axis, but many are not so long and often abut against them. The minor septa are extremely short. The tabulæ and dissepiments are as diagnosed for the genus.

The commonest species of *Mictophyllum* is a coral about 5 cm. long, with septa which may be thin throughout, as in the genotype, or may be peripherally dilated. A third form, represented by a coral of the size of the holotype of *M. nobile*, has septa which peripherally are thin, but axially are dilated.

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EXPLANATION OF PLATE IV.

Mictophyllum nobile, gen. et sp. n. Holotype, × 1·5. Upper Devonian, Bed S. Gorge of Redknife River, Mackenzie River Region, N.W. Canada.

Fig. 1 *a*. Transverse section.
Fig. 1 *b*. Longitudinal section.

MISCELLANEOUS.

The Genera Pseudaplodon *and* Aplodontia.

To the Editors of the 'Annals and Magazine of Natural History.'

Gentlemen,—Schlosser avait décrit, en 1924, d'après des matériaux de l'Université d'Upsal, une forme asiatique du genre *Aplodontia* (*Aplodontia asiatica* Schl. du Pontien de Mongolie), lequel genre n'était connu, jusque là, que comme exclusivement nord-américain.—En 1927, M. Gerrit S. Miller Jr. a fait de cette espèce le type d'un genre nouveau, *Pseudaplodon*.

Dans un court mémoire paru dans votre périodique, en 1937, j'ai donné, à la suite d'observations faites, à Upsal, sur les matériaux en question, les raisons qui me faisaient me rallier à l'opinion de Schlosser.

M. Gerrit S. Miller Jr. estime que la comparaison des dents jugales abrasées de l'*Aplodontia asiatica* Schl. et de l'*Aplodontia major* Merriam, actuel en Amérique du Nord, que j'ai représentées aux figures 3 et 9 de la note précitée fait ressortir suffisamment que l'*Aplodontia asiatica* est bien le type d'un genre différent du genre *Aplodontia* américain.

Les différences des deux dentitions représentées (figure 3, *Aplodontia asiatica* Schl. et figure 9, *Aplodontia major* Merriam) tiennent simplement à ce que :

1°: la longueur des tubes intermédiaires est très différente chez l'*Aplodontia major* et chez l'*Aplodontia asiatica*. Si on ne voit pas de tubes intermédiaires chez l'*Aplodontia major*, c'est que ces tubes, très courts, se trouvent déjà dépassés par le niveau de l'abrasion. Si on en voit, au contraire, chez l'*Aplodontia asiatica*, et d'autant plus importants que la dent est plus jeune quant à son moment d'éruption, c'est que, dans cette forme fossile, les tubes sont très longs ; en M_1 (la plus abrasée des dents jugales et la première suivant l'ordre d'éruption), le niveau en est déjà dépassé.—La régression des tubes intermédiaires au cours de l'évolution, dans un groupe étroit de Rongeurs, n'est pas spéciale aux Aplodontidæ ; on l'observe, par exemple, chez les Siphneidæ, le *Prosiphneus Eriksoni* Schl. (Pontien de Mongolie) a de longs tubes intermédiaires, alors que, chez les *Siphneus* actuels, beaucoup plus hypsodontes, ces tubes, lorsqu'ils existent, sont très courts.

2° : la colonnette interne [dont la saillie en forme d'éperon (mesostyle in G. S. Miller Jr.) est la coupe] se prolonge beaucoup plus bas chez la forme actuelle, plus hypsodonte, que chez la forme fossile. C'est pourquoi le "mesostyle" n'est visible, dans la figure 3, que sur la dent la plus jeune, P_4, alors que, dans la figure 9, la colonnette, descendant beaucoup plus bas, est visible sur toutes les dents, même les plus abrasées.

Les différences qui existent entre les deux dentitions représentées (figures 3 et 9) tiennent donc, en résumé, au fait que la dentition du Rongeur fossile est à croissance moins prolongée (et aussi ne se trouve pas au même stade d'abrasion) que celle du Rongeur actuel. D'une manière générale, de telles différences entre un fossile et un actuel ne me paraissent pas suffisantes pour justifier la création d'un genre nouveau, même lorsque, comme dans le cas présent, il existe une très grande différence d'habitat.

Faithfully yours,
Dr. MADELEINE FRIANT.

Laboratoire d'Anatomie comparée,
Museum national d'Histoire naturelle, Paris.

BIBILIOGRAPHICAL NOTICES.

WILLIAM A. RILEY and OSKAR A. JOHANNSEN. *Medical Entomology. A Survey of Insects and allied Forms which affect the Health of Man and Animals.* Second Edition. xiv+482 pp., 184 figs. London: McGraw-Hill Publishing Company, Ltd. Price 25*s*.

THE first edition of this useful textbook appeared six years ago, and the rapid progress in the field of medical entomology made necessary a revision of many chapters. Substantial changes have been made in the sections dealing with sand-flies as probable vectors of kala-azar; mosquitoes with reference to encephalomyelitis; the distribution of vectors of Rocky Mountain spotted fever, endemic typhus, jungle yellow fever, etc. While a great deal of new information has been incorporated it appears that in some cases the authors tried to restrict the changes to the barest minimum. Thus, for example, the section on tsetse-flies includes only a passing reference to the ecological methods of control on which so much work has been recently done in Africa. Six pages of supplementary bibliographical references, in addition to the original thirty pages, will prove very useful for students, since the most important literature up to 1937 is taken into account.

WIEMAN, H. L. *General Zoology.* Third Edition. 497 pp., 271 figs. London: McGraw-Hill Publishing Company, Ltd. Price 21*s*.

IT is not stated to what type of student this textbook by an American author would be recommended in the United States, but judging by the standards of this country it can be classified as an adequate introductory book for students preparing for the University entrance and scholarship examinations. It can also form a useful supplement to the general first-year zoology course, since it deals with general problems rather than with the descriptive details of set types. This is the leading feature of the book, and it is certainly welcome. Some of the general chapters, *e.g.*, on the endocrine system, evolution, and heredity, are particularly good, being clear and concise. Others, such as those treating cell division, enzymes, and gastrulation, want bringing up to date. Chapters on classification are less satisfactory, since they contain too much detail for an introductory course, while being inadequate for more advanced studies. Many of the illustrations are definitely poor, and lack clearness, which is so essential in a textbook.

The Lyrebird: Australia's Wonder Songster.

By R. T. Littlejohns, R.A.O.U. Price 4*s.* 6*d.*

Modern photography has made us familiar with the habits of birds in the most distant parts of the world, so that we now know more about some of them than we do about many of our own native species.

And one of the species to receive most attention has been the almost legendary lyrebird, successfully photographed by a number of naturalists during the past few years. As the author points out, it is a bird remarkable both from its plumes and powers as a vocalist—an unusual combination in highly ornate birds. As a songster, and more especially as a mimic, it is almost unique among birds, and this feature alone would have put it in the limelight; but the truly amazing dance and display of the tail-plumes—rivalling even those of the birds of paradise and some of the pheasants—make an even more fascinating study.

The main object of the book is the excellent series of thirty full-page photographs, most of which are from a film taken by the author, and which give as full an account of the habits and life-history as one could wish for. The male is shown in all attitudes on the dancing-ground, and the photographs provide a really fascinating picture of the performance; plate 30 is particularly interesting, as it shows a series of six "shots" from the author's film, illustrating all stages of the dance from the initial raising of the plumes above the head.

Although the performance of the male is the principal feature of the book there are a number of attractive studies of the nesting activities; the female at the nest, the young, and the type of country in which the nest is situated.

The photographs are prefaced by a short but adequate account of the bird and its life-history. Even though questions of systematic interest are obviously out of place in a book of this kind, it is surely a little sweeping to describe the lyrebird as not related to any other bird, as is done on p. 5.

The rather flimsy paper cover of the book with a somewhat grotesque study in brown and green of a lyrebird displaying, on the outside, detracts from the book as a whole, and is by no means up to the standard of the contents.

It is published at the moderate price of four shillings and sixpence.

Australian Parrots : their Habits in the Field and Aviary. By NEVILLE W. CAYLEY. Price 15*s*.

GOOD books on parrots are few and far between, and it is therefore doubly pleasant to have one deserving of little but praise. Mr. Neville Cayley is the author of several books on Australian birds, and this is a companion to his 'Australian Finches.' Like it, 'Australian Parrots ' is primarily intended for the not too scientific naturalist in Australia who wants to learn something about the parrots in which his country is so rich. But there is something to interest everybody—each of the fifty-nine species is figured in colour, and a careful account is given of its history, description, breeding biology, habits, distribution, and treatment in captivity.

The coloured plates are by the author ; every bird is drawn to scale, and the standard of the figures is high, particularly as regards the sharpness and cleanness of the colours. By way of a minor criticism, the keys to the plates seem rather clumsy ; they take the form of black and white outline drawings on the opposite page to the coloured figures. It would also have been helpful to have a reference to the page number of each plate with the description of the individual species.

In addition to the eleven coloured plates there are a number of full-page photographs of various species in the field, and (a particularly pleasing feature), eleven photographic reproductions of the early historic drawings of the Australian parrots.

The field-notes are excellent, and the author has adopted the laudable practice of quoting the source of his information in full, as well as giving the reference to where it was obtained.

A map of the distribution is given for each species—an essential but by no means universal feature of books of this type—and the type-locality from which each was described is mentioned. Avicultural notes are given for each species that has been kept in captivity, and, as with the field-notes. Mr. Cayley adopts the practice of quoting all available literature on the subject.

The book is essential to anyone interested in Australian parrots, be he systematist, field naturalist, or aviculturist.

The price of fifteen shillings is reasonable.

THE

ANNALS AND MAGAZINE
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NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 14. FEBRUARY 1939.

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XVII.—*The Coxal Joint and its Outgrowths in certain Isopod Crustacea.* By EDITH M. SHEPPARD, M.Sc., F.Z.S., Department of Zoology and Comparative Anatomy, University College, Cardiff.

THE coxal joint of the thoracic limb in its simplest form consists of a ring-like structure movably articulated proximally with the wall of the somite to which it belongs, and distally with the basis of the limb. Such a condition is exemplified, to take a familiar example, by the Isopod *Asellus aquaticus*, but it is also common to many members of the Malacostracea.

There is, however, in most families of the Isopods, a more or less marked tendency towards the development of coxal plates, and this development is extremely variable and may affect all or only a few of the thoracic appendages of even a single individual.

The only type of coxal plate so far recognized is one developed on the outer side of the joint and extending on to the lateral and even the dorsal surfaces of the body in varying degrees. The plate may be separated from the tergum of its somite by a definite articulation or it may be fused with the tergum, the former suture being either indicated by a slight groove or entirely obliterated.

Apart from the development of brood-lamellæ the possibility of a corresponding coxal expansion of the inner border of the joint appears to have been overlooked, yet the examination of a number of Isopod types suggests that such a development does occur. In the following types, chosen to illustrate this point, specimens of both sexes were examined, and, in the case of the female, both in the breeding and the non-breeding condition.

Asellus aquaticus (Linnæus).

The coxal joint, in both sexes, is in the form of a ring-like joint as described above. In the non-breeding female there are four pairs of brood-plates developed on the inner sides of the coxæ of the second to the fifth pairs of thoracic limbs. These are small, parallel-sided processes extending towards the mid-ventral line. In the breeding female these processes are replaced by large overlapping plates which form a complete marsupium. Each plate is directly continuous with the inner side of the coxal joint of the limb to which it belongs.

An examination of the ventral body-wall in the region of the marsupium shows no obvious difference from that of the non-breeding female or the male.

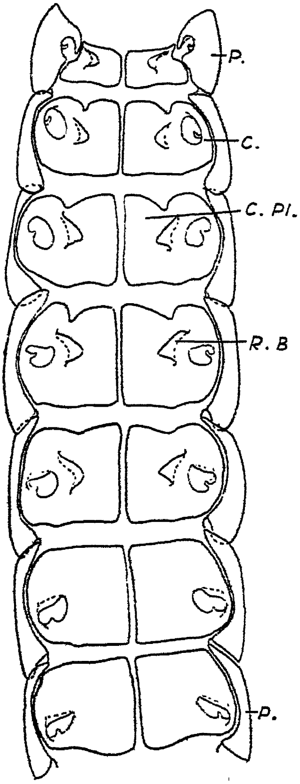
Idotea hectica Pallas.

This species is included by Calman (1909), p. 202, in a series of forms illustrating the substitution of pleural plates by the development of coxal plates from the coxæ of the thoracic appendages in the family Idoteidæ. In this species Calman points out that "the pleural plates of the thoracic somites are well developed and completely cover the coxopodites, of which the outline can be traced on the under side of the plates near the outer edge." In his figure (p. 202, fig. 123 A) illustrating this point the outline of the coxal joint is clearly defined on its outer margin, but that of its inner limit is shown fused with the ventral integument. The position of the oostegite rudiment is also shown.

After an examination of both male and female specimens of this species, I have come to the conclusion that the inner margin of the coxal joint is also expanded into a plate which extends towards the mid-ventral line. In the male and the non-breeding female the two plates of any one somite are separated from one another by a narrow median strip of unchitinized membrane; this membrane also separates each plate from its neighbour both in front and behind (fig. 1).

The second thoracic somite differs from the following ones in that the pleural plates are larger, more curved, and extend further on to the ventral surface of the body.

Fig. 1.



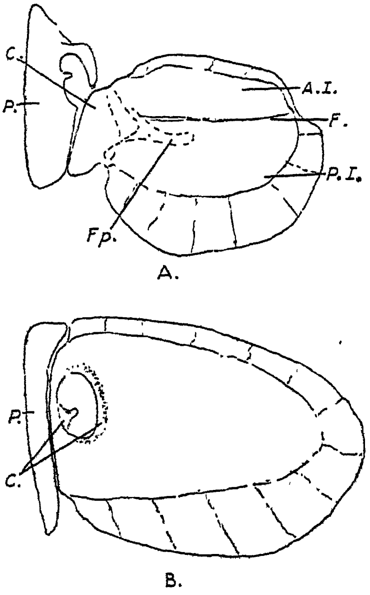
Ventral view of *Idotea hectica* (non-breeding female), showing the second to the eighth thoracic somite.

P., pleuron ; *C.*, coxa ; *C.Pl.*, coxal plate ; *R.B.*, rudiment of brood-plate.

In correlation with this fact the coxal joints have become modified (see fig. 1). Here either the coxal joint has become fused with the pleural expansion and its inwardly directed plate has become secondarily separated off from it or the outer portion of the joint has disappeared, leaving only the inwardly directed plate. If this is so, then the articular function of the joint is mainly carried out by the pleural expansion, the coxal plate forming the inner border of the articular cavity. The former of these two views is probably the correct one.

The oostegite rudiments of the non-breeding female are found on these coxal plates of the second to the sixth thoracic somites inclusive, and appear as a series of small projections (fig. 1), formed as out-pushings, one on each plate, some short distance from the inner margin of the articular cavity.

Fig. 2.



Brood-lamellæ of *Idotea hectica* (breeding female). A. Lamella and pleuron of second thoracic somite. B. Lamella and pleuron of third thoracic somite.

P., pleuron; *C.*, coxa; *A.L.*, anterior lobe; *P.L.*, posterior lobe; *F.*, fold; *Fp.*, finger-like projection.

In the breeding female these rudiments are replaced by a corresponding number of large, somewhat chitinized plates which overlap one another to form a complete marsupium (fig. 2, B); these plates (except for the first pair) bear exactly similar relations to the coxal joints as do the corresponding ones in *Asellus aquaticus*.

The first pair of plates (fig. 2, A), like those of *Asellus*, differ from the remaining ones in that each is folded upon itself; the anterior fold (fig. 2, A, *A.L.*) is the smaller and partly covers the mouth-parts, the posterior portion forming the anterior limit of the marsupium. Near the base of the lamella, in the region of the fold, is a finger-like out-pushing of its wall (*Fp.*) which projects into the marsupium; this may be concerned with the movement of water within the cavity of the pouch.

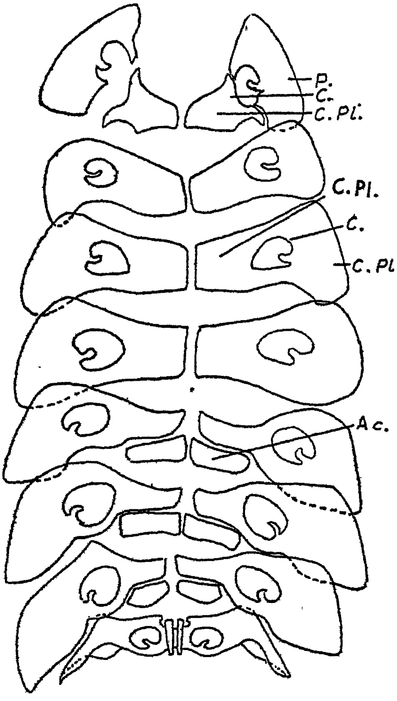
If the ventral surface of a breeding female is examined after the removal of the oostegites, it will be found that the ventral integument is only slightly chitinized in the region of the marsupium, and there is no central suture or division in the so-called "sternites" (coxal plates of this paper). Beyond the limit of the marsupium, in the region of the last two thoracic somites, the appearance of the ventral surface is similar to that of the non-breeding female and the male. The chitinization of the ventral integument appears as a series of slightly thickened bars (*cf.* fig. 6) which leave a broad unchitinized central area very similar to the normal condition of such a form as *Cirolana obtusata*. Thus the coxal plates in the breeding female no longer form a ventral protection to the integument.

The origin of the brood-plates may thus be regarded as coxal outgrowths comparable to those of *Asellus aquaticus*, and not to outgrowths of the sterna (*cf.* Calman (1909), p. 203), who, after referring to the coxal origin of these plates in the Asellota, continues: "In other tribes the coxopodites are more or less completely coalesced with the corresponding somites, and the oostegites appear to spring from the ventral surface of the body close to the bases of the legs."

Idotea emarginata (Fabr.).

Collinge (1917), p. 741, in his revision of the British Idoteidæ, includes in the diagnosis of this species the statement "coxal plates wide and occupying the whole of the lateral margins of the second to seventh segments, posterior angle of the seventh produced backwardly as a sharp spine." In the introductory part of the same paper (p. 732) he says that "In most members of this family the coxopodites of the appendages are developed to such an extent as to protrude beyond the pleural plates or overlap or replace them on the dorsal surface," but he makes no mention of their behaviour on the ventral surface.

Fig. 3.



Ventral view of *Idotea emarginata* (male), showing the second to the eighth thoracic somite.

C., coxal joint with coxal plate (*C.Pl.*); *P.*, pleuron; *Ac.*, accessory plate.

In the male (fig. 3) and the non-breeding female of this species the coxal joints are produced into plates, which extend on to the dorso-lateral surface of the body, where, except for the first pair, they are clearly marked off from their respective terga by sutures. The inner margins of the coxal joints, when viewed from the ventral surface of the body, appear as flattened plates extending towards the mid-ventral line—those of any one somite being separated from one another by a band of ventral integument. The plates of the first four free somites

Fig. 4.

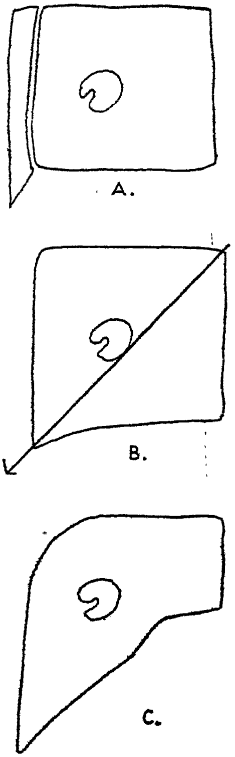


Diagram illustrating the supposed change in form of the coxal plate (6th, 7th, or 8th thoracic) from the *Idotea hectica* to the *I. emarginata* condition. (Ventral view.)

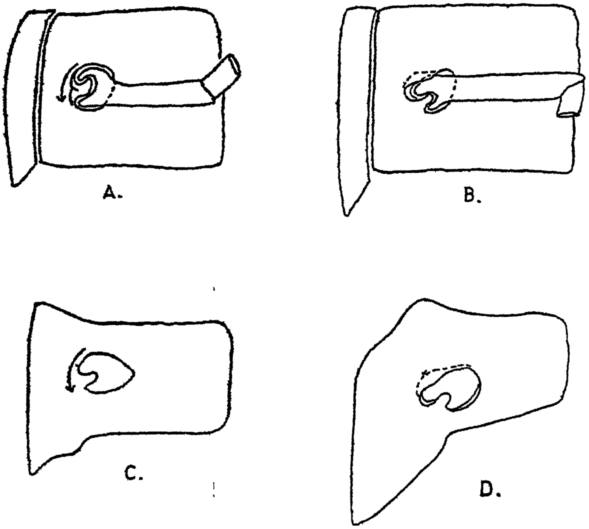
A. *Idotea hectica* type with ventral extension of pleuron.
B. Intermediate condition.
C. *Idotea emarginata* type.

Arrow indicates direction of pull.

are broad and form the only support to the ventral integument of their respective somites; those of the last three are narrower and lie in the anterior halves of the somites; the posterior portions are protected by a second series of plates, two to each somite, each extending from near the outer end of a coxal plate almost to the mid-ventral line (see fig. 3, *Ac.*).

It is possible that the form of the coxal plate, and the extent of the ventral integument covered by any one plate, is correlated with the amount of its lateral extension and also with the size of the respective limb and the angle at which it is carried in relation to the body.

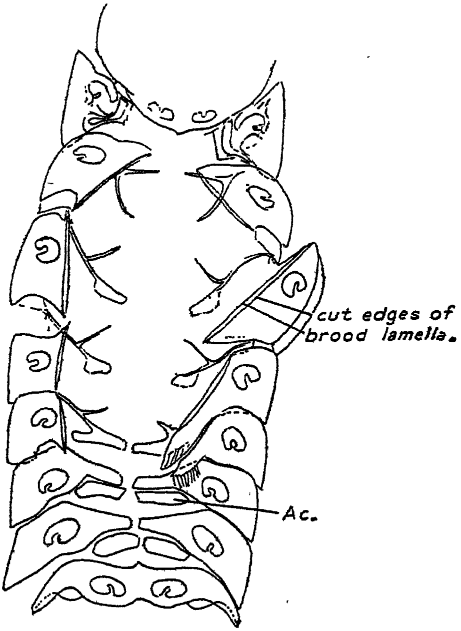
Fig. 5.



Diagrams illustrating the position of the articular process in the coxa of: A, the second thoracic somite, and B, the last thoracic somite, of *Idotea hectica*; and C, the second, and D, the last, of *Idotea emarginata*. Arrow indicates the direction of movement of process to produce conditions B and D.

In a form such as *Idotea hectica* the pleural plates form the lateral margins of the segments, and the posterior angles of these are produced backwards in increasing amounts from the second to the eighth somite. In *I. emarginata* the coxal plates replace these pleural extensions and their posterior angles are similarly produced. If a plate of the *I. hectica* type was extended laterally on to the side of the body, and its outer posterior angle was then produced posteriorly, a strain would be set up. This would take the form of a pull in an oblique direction from the inner anterior angle of the plate to the posterior outer angle (fig. 4, B). The pull would tend to shorten the length of the inner margin of the plate and to produce a condition similar to that of the last three somites in *I. emarginata* (fig. 4, C.)

Fig. 6.



Ventral view of *Idotea emarginata* (breeding female), showing the second to the eighth thoracic somites, with the brood-plates cut off near their bases. *Ac.*, accessory plate.

The thoracic limbs of *I. hectica* do not vary very much in size, though the last three pairs are slightly the larger; neither is there any marked difference in the angle at which the basis of the limb is carried, although the first three pairs are directed forwards, the fourth more or less transversely and the last three pairs backwards.

An examination of the articular process of the second thoracic coxal joint shows that it lies on the outer side of the articular cavity and is parallel with the transverse axis of the somite (fig. 5, A). A similar examination of the articular cavity of the last thoracic coxal joint shows that the articular process has undergone a rotation in a posterior direction, so that instead of lying parallel with the transverse axis of the somite, it lies at an angle with it and nearer its posterior margin (fig. 5, B).

This movement is accompanied by the development of a slight fold of the integument in the anterior wall of the socket; the articular processes of the coxal joints between the second and the last already mentioned form a series of intermediate positions.

In *I. emarginata* the increase in the size of the thoracic limbs from before backwards is more marked than it is in *I. hectica*, but the change in the angle at which they are carried in the two species is very similar; in *I. emarginata* there is a corresponding rotation in the position of the articular process (fig. 5, C & D).

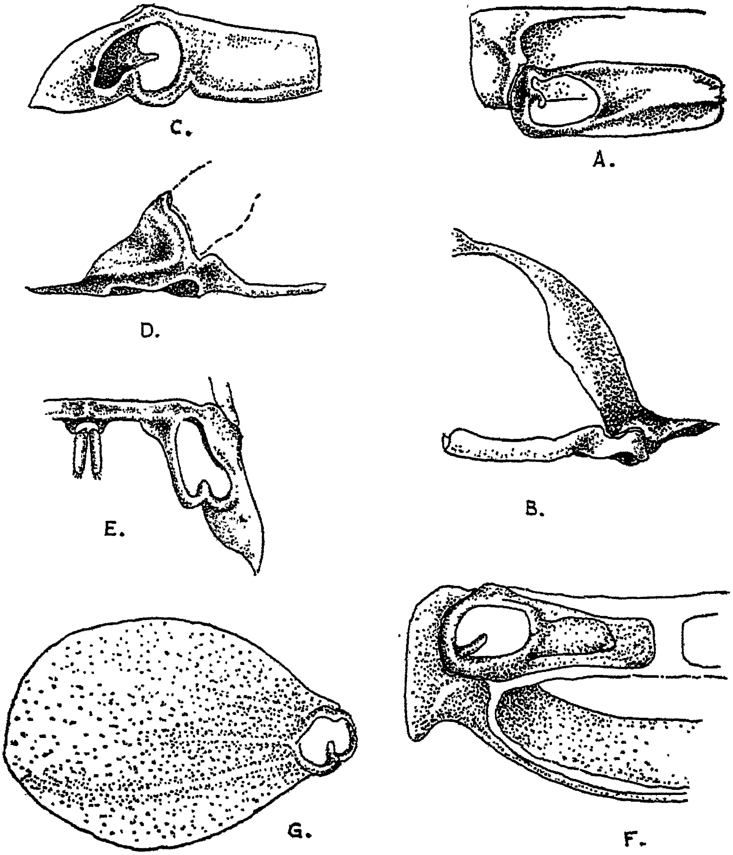
The form of the brood-plates in the non-breeding female is very similar to that of *I. hectica*, and each is developed in a similar position. In the breeding female the lamellæ are large, more or less parallel-sided plates which overlap one another to form a complete marsupium. An examination of the ventral integument in the marsupial region of such a female shows a condition exactly similar to that already described for *I. hectica* (see fig. 6).

Glyptonotus antarcticus Eights.

In the male and the non-breeding female of this species the first four free thoracic somites possess broad pleura which extend over the bases of the limbs; in the last three somites well-developed coxal plates extending on to the dorsal surface of the body replace the pleura of the anterior somites; these plates are marked off by deep sutures from their respective terga. Careful examination of the ventral surfaces of the first four free somites shows that each coxal joint is clearly defined, the outer margin is ring-like and, except for that of the first, is clearly marked off from the ventral surface of the pleuron by a suture; the inner margin is produced, as in the species of *Idotea*, as a coxal plate which extends to the mid-ventral line (fig. 7, A & B).

In the hinder three somites, as mentioned above, the pleura are replaced by coxal plates which extend on to the dorsal surface of their respective somites; as in the first four somites, coxal plates also extend from the inner borders of the joints to the mid-ventral line; those of the last somite are fused together (fig. 7, E), but a line of fusion is still visible.

Fig. 7.



Glyptonotus antarcticus.

A, ventral view of the third thoracic coxal joint and its plate; B, posterior view of the same; C, ventral view of sixth coxal joint and its plates; D, posterior view of the same; E, ventral view of the last thoracic coxal joint and its plates (male); F, ventral view of third thoracic coxal joint of non-breeding female; G, brood-lamella and coxal joint of breeding female.

In this species the brood-plates of the non-breeding female appear as five pairs of bud-like outgrowths from the inner sides of the coxal joints (fig. 7, F) of somites two to six inclusive. In the breeding female these are replaced by large chitinized lamellæ (fig. 7, G), overlapping one another so as to form a complete marsupium.

The ventral wall of a breeding female, like that of *I. hectica* and *I. emarginata*, is only slightly chitinized in the region of the marsupium, so that a broad, thin-walled area of ventral integument is left in the mid-ventral region. The plates of the last thoracic somite are similar to those of the non-breeding female, but those of the penultimate somite are considerably narrower and do not meet in the mid-ventral line; this modification, which does not occur in the other species mentioned, is probably due to the increased area of ventral integument included in the marsupium.

According to Tait (1917), p. 264, the division in the middle of the ventral sternites (space between the coxal plates of this paper) is a device for allowing distension of the body after a meal. In referring to a similar condition in *Chiridotea* Tait (1926), p. 342, says: "One may see that the ventral aspect of *Chiridotea* after the animal has fed to satiety, is markedly protuberant, the halves of the divided sternites being widely separated. During fasting the split sternites come together again and even overlap slightly. It is noteworthy, too, that in *Chiridotea*, which has a relatively longer mid-gut than *Glyptonotus*, the last sternite of the series is also mesially divided, whereas in the latter this sternite is rigidly calcified."

These observations of Tait suggest a possible explanation for the fact that the anterior ventral coxal plates do not fuse with one another in the mid-ventral line to form a more rigid ventral support, whilst the more posterior ones may do so.

CONCLUSIONS.

Since it is a generally accepted fact that the coxal joints of the thoracic appendages of many Isopods are expanded to form coxal plates which extend on to the lateral, and sometimes also on to the dorsal surface of the body, there seems to be no adequate reason why similar expansions should not extend inwards on to the ventral surface of the body.

An Isopod, with one or two exceptions, is a dorso-ventrally flattened animal which consequently has a broad ventral surface; this, especially in the larger types, needs to be well protected. The development of coxal plates would serve this purpose, and would, in addition, form a firm place of attachment for the muscles of the body.

The condition seen in the breeding female of the three species described above lends support to the coxal origin of these plates. The modification of the ventral body-wall in the marsupial region, where the plates are absent from those limbs bearing oostegites, and the wall is only slightly chitinized, is very significant. Together with this is the fact that the oostegites bear exactly similar relations to the coxal joint as they do in such a type as *Asellus aquaticus*, where the joint is of the ring-like type.

This modification of the ventral wall allows for an increase in the size of the marsupium not only ventrally by the bending downwards of the oostegites but also dorsally by the compression of the ventral wall towards the dorsal surface of the body.

The chitinized oostegites have taken over the protective function of the coxal plates, and the development of the secondary thickenings in the ventral integument form sufficient skeletal structure for the attachment of muscles in the presumably less active breeding female.

The advantage of this interpertation is that:

1. It allows a rational explanation for the presence of a mid-ventral suture in all or most of the thoracic somites of many Isopods; these sutures are absent from members of other groups, or, if present, can be interpreted in another way (some Decapods).

2. It unifies the position of origin of the oostegites—that is, from the inner side of the coxal joint rather than from the coxal joint in some forms and from the so-called ventral sternites in others.

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XVIII.—*On some new or little-known Papuan* Aphodiidæ *(Coleoptera)*. By Renaud Paulian, Laboratoire d'Entomologie, Muséum National d'Histoire Naturelle, Paris.

Through the courtesy of Mr. G. J. Arrow, I have had the opportunity of studying a small collection of Aphodiidæ made by Miss Cheesman during her trips to New Guinea. This collection, though small, was of real interest, the more so as New Guinea is a bad collecting ground and as its insect fauna is actually very imperfectly known. Of the eight species collected two were new; these I take great pleasure in naming after Miss Cheesman, to commemorate the importance of the entomological material collected by her.

It is still much too early to give a general survey of the Coprophagous fauna of Papua and the adjacent islands from a biogeographical point of view, but it may be well to note that, while the Coprids are very distinctly of Australian origin and show no Malay influence, on the contrary the Aphodiids are distinctly of Malay origin. Unfortunately I have no data on the Solomon Islands and nearly no data on the New Hebrides.

Aphodius (*Trichaphodius*) *Reichei* Har.—Papua: Mafulu (4000′, xii. 33–i. 34); Kokoda (1200′, viii. 33); Mt. Tafa (8500′, ii. 34).

This is a very variable and widely distributed species. The specimens collected have a rather densely and nearly completely punctured thorax.

Atænius parvispinus Schm.—Papua: Kokoda; Dutch New Guinea: Mts. Cyclops, Mt. Lina (3500′, iii. 36).

Schmidt described this species from New Guinea and stated that the elytral interstriæ were very finely punctured. In the specimens collected, agreeing perfectly for the rest with the type as described by Schmidt, the interstriæ are distinctly punctured.

Atænius granulator Har.—Mts. Cyclops, Sabron (930′), Lake Sentari, Iffar.

Described in 1877 by v. Harold from the material collected in New Guinea by the Marquess Doria, *A. granulator* appears to have remained unnoticed since then. It was unknown to Schmidt in 1922. In 1920 this author described from New Pomerania a new species, *A. canaliculatus*, which, judging from his detailed description, is identical with *A. granulator*.

Atænius interstitialis Fairm. ?—Kokoda.

This species, described as *Oxyomus* by Fairmaire, from a specimen from Mioko Island, was redescribed by Schmidt from the type specimen. According to these descriptions the specimen taken by Miss Cheesman belongs probably to this species, but it is noteworthy that, while it is completely covered with short yellow setæ, neither of the authors above named give any reference to the pubescence of the thorax.

Atænius cheesmani, sp. n.

Kokoda, under stones at the river side. Type in the British Museum.

Allied to *parvispinus* but distinctly different. The whole upper surface is shagreened, very feebly on the head and prothorax, more strongly on the elytra. Elongate, parallel, not very convex, very dark brown, not very shining above, without hair or setæ above. Clypeus very feebly sinuate in front, the lateral angles with a small pointed tooth, middle of the head raised; front margin with a smooth transverse zone, hind margin with a strong and close puncturation, the punctures round, rather unequal and simple; the remaining part of the head is covered with closely set punctures united by two or three in longitudinally disposed pits. Sides of the head nearly straight.

Thorax wider than the elytra, with a double (strong and fine), very close, regular, puncturation. Base without margin, the margin well marked along the sides and on the obtusely rounded hind angles. Front angles with a small transverse depression; middle of the sides with a similar depression; posterior half of the prothorax with a distinct median longitudinal sulcus.

Scutellum unpunctured. Elytra with a strong, rather blunt, outwardly directed, humeral spine. Interstriæ nearly plane on the back, rather raised at the apex. Striæ deep, not very wide, strongly punctured, the punctures cutting into the sides of the interstriæ, particularly the inner side of each interstria. Interstriæ punctured, the first with a regular line of closely set and rather strong punctures, the others with rather sparse and irregular punctures.

Posterior tibiæ without supplementary apical spur. Metatarsus rather broad, distinctly longer than the upper apical spur, equal to the remaining part of the tarsus.

Length 4·5–5 mm.

Saprosites marchionalis Har.—Mts. Cyclops, Orrori (vii. 33).

A species described from Borneo. Schmidt considered as belonging to it a series of much smaller *Saprosites* from India. The specimens from New Guinea, while agreeing with the Malayan specimens in size and general structure, differ from them, and from the Indian specimens, by a much sparser and finer puncturation on the fore part of the head and on the thorax. As the species appears variable it seems inadvisable to separate these specimens from the typical form.

Saprosites Brouni Sharp.—Mt. Tafa, Mafulu, Kokoda.

This species was described from New Zealand. Unfortunately I have not seen specimens from this locality, but the detailed description given by Schmidt led me some time ago to identify it with two specimens from Northern Queensland. The specimens from Papua agree even better with the description (the puncturation is finer and more sparse), so I have no doubt as to their identity; it seems that the species, though rare, is widely distributed throughout Australasia.

Sprosites cheesmani, sp. n.

Papua: Mt. Tafa (8,500′, ii.–iii. 34). Type in the British Museum.

Allied to *læviceps* Har., but distinct by the absence of emargination near the hind angles of the thorax and by the puncturation.

Slender, parallel, convex, black, shining, upper surface not shagreened. Head convex, feebly sinuate in front, hind margin with a strong and rather close, though irregular, puncturation for a short distance; in front of this zone the head is completely covered by a very sparse and rather feeble puncturation, stronger on the sides of the head.

Thorax of the same width as the elytra. Sides, hind angles, and a short part of the base strongly margined, the remaining part of the base without margin and without any particular grouping of the punctures; no median longitudinal sulcus. Puncturation simple, fine and rather close on the middle of the front margin, strong and fine, but always rather sparse, on the remaining part. Elytra with nearly plane interstriæ on the back, feebly raised interstriæ at the apex. Puncturation practically absent on the interstriæ. Striæ strong, wide, punctured, the punctures cutting into the interstriæ.

Mesosternum only very slightly lower than the metasternum. Metasternum with a long, deep, longitudinal sulcus, the disc of the metasternum nearly smooth, with a very few small punctures. Abdominal sternites nearly smooth, covered along their anterior margin with short and strong, parallel, longitudinal carinæ, the sides of the basal segments have a few complete parallel longitudinal grooves.

Apical margin of the hind tibiæ finely serrate between the apical setæ. Metatarsus of the hind legs shorter than the apical spur, longer than the remaining part of the tarsus.

Length 3·5–4 mm.

XIX.—*Descriptions and Records of Bees.*—CLXXI.

By T. D. A. Cockerell, University of Colorado.

The African bees recorded below all belong to the British Museum.

Pœcilomelitta fuliginosa Friese.

S.W. Africa: Okahandja, Jan. 1928, 15 ♀, 14 ♂ (*Turner*).

They are numbered 33. When (1936) I described *P. latifrons* from the male I suggested that it might be the unknown sex of *P. fuliginosa*, but regarded this as improbable. It is now evident, however, that they represent a single species, and *P. latifrons* must be treated as a synonym.

Scrapter ruficornis (Cockerell).

Cape Province : Swellendam, Dec. 1931 (*Turner*).

♀, with red mesonotum (see 'Entomologist,' Oct. 1935, p. 238).

Halictus sanguinibasis, sp. n.

♀.—Length about 7 mm., anterior wing 5·5.

Black, robust, with the first two tergites entirely bright chestnut-red, the others intense black, except that the third is red at extreme base in middle ; antennæ black, the flagellum faintly brownish beneath ; head broad ; clypeus shining, somewhat bigibbous anteriorly ; front dull, but vertex polished ; hair of thorax scanty and pale ; mesothorax very finely punctured, moderately shining ; scutellum dullish, noticeably less shining than the region just before it ; area of metathorax dull, with shining margin ; tegulæ shining black. Wings strongly dusky, stigma reddish brown, nervures brown ; first recurrent nervure received by second cubital cell near end ; third cubital cell short. Legs black. Abdomen shining, without tegumentary bands ; in lateral view the third and fourth tergites show pale hair along their hind margins ; venter with short white hair.

Cape Province: Katberg, 4000 ft., Jan. 1–15, 1933 (*R. E. Turner*).

By reason of the red base of abdomen this falls with *H. andreniformis* Friese, but that has yellow bands on the first three tergites and fulvous tegulæ. Blüthgen (1929) discusses *H. andreniformis*, and concludes that it was a mixture of two or three species. He designates as the type a female from "Capland," but it does not agree in the colour of the legs with Friese's description, and it seems probable that the real type was the specimen from Bulawayo, not seen by Blüthgen.

Chelostoma rufulum Cockerell.

Cape Province: Prince Albert Road, Nov. 1931. 2 ♀ (*R. E. Turner*).

Lithurgus sparganotes (Schletterer).

Sierra Leone : N'Jala, Aug. 17, 1930 (*E. Hargreaves*).

Nomioides muiri Cockerell.

This was described from the female. In Amer. Mus. Novitates, 547, I described the male (taken with a typical female in S. Rhodesia) as having yellow bands on tergites 2 and 3. Blüthgen (Stett. Ent. Zeit. 1934, p. 257) made the comment that with *N. muiri* (which he regards as a race of *N. variegata*) were taken males variously ornamented, corresponding with the male varieties called *intermedia* Alfken, *luderitzi* Blüthg., and *quinquefasciata* Blüthg. The males of *N. variegata* (as understood by Blüthgen) vary from var. *unifasciata* Blüthg. (which I have from Ordubad), with a yellow band only on the third tergite, to var. *quinquefasciata* Blüthg. (from Okahandja, S.W. Africa), with five broad yellow bands. There is even a variety from Algeria with no yellow on abdomen (v. *nigriventris* Blüthg.).

The Ogilvies took female *N. muiri* at Seeheim, Windhoek, and Otavifontein in S.W. Africa, Upington, Cape Province, and Palapye Road, Bechuanaland. Many males were taken at Seeheim and three at Upington, as well as one at Bot River, Cape Province. These males have yellow bands on tergites 2 to 5, and are on the whole a very uniform lot. If the insect from the south-western part of Africa is to be separated from typical *N. muiri* (which came from Mozambique) it will apparently take the name *N. luderitzi* (Blüthgen), with the var. *quinquefasciata* as an individual variation. This solution receives some support from the fact that Miss Ireland (Annals Transvaal Mus. 1935) found small differences between the genitalia of *N. luderitzi* and *N. muiri*, though no males of the latter were seen from the type-locality. My present view is that *N. muiri* is a valid species, with *luderitzi* probably a distinct subspecies. Males from the eastern side of South Africa are different, and I have referred specimens from S. Rhodesia and the Transvaal to *N. variegata* (Ann. Mus. Novitates, 857), though they probably should go with *N. muiri*.

Nomioides maculiventris (Cam.).

S.W. Africa : Windhoek, Dec. 14 (*J. O.*, *L. O.*). Cape Province : Bot River, Dec. 12 (*J. Ogilive*).

Nomioides somalica completa Blüthgen.

S.W. Africa : Usakos, Jan. 16 (*K. O.*, *J. O.*).

In Am. Mus. Novit. 857 I gave as one of the characters the absence of black spots on the clypeus, but I find that in Usakos specimens thay may be present or absent.

Tetralonia natalica simmondsi, subsp. n.

♀.—Agrees in general with *T. natalica* Ckll., but distinguished by the dark greyish-brown hair of mesonotum and scutellum. The flagellum is very faintly brownish beneath and the hind legs have light red hair.

Cape Peninsula : Cape Town to Cape Point, Nov. 6–13, 1930 (*H. W. Simmonds*).

This may be separated from a series of similar females as follows :—

	Clypeus with a broad light yellow apical band .	*vansoni* Ckll.
	Clypeus all black	1.
1.	Facial quadrangle conspicuously longer than broad ; flagellum red at tip	*nubilis* Ckll.
	Facial quadrangle not longer than broad	2.
2.	Apical part of fourth tergite entirely covered with white hair	*braunsiana* Friese.
	Apical part of fourth tergite broadly bare, except at extreme sides	3.
3.	Apical plate narrower ; thorax with dark greyish-brown hair on mesonotum and scutellum.	
	Apical plate broader ; thorax with light fulvous hair above	*natalica* Ckll.

There is just a possibility that the female now described may belong with *T. capilia* Strand, described from the male. I name this bee after the collector, well-known especially for his work in Fiji.

Nothylæus junodi (Friese).

Cape Province : Swellendam, Dec.–Jan. (*R. E. Turner*).

Bridwell treats this as a synonym of *N. rufipedoides* (Strand). Both were published on 1911, but Friese's paper reached me first, and probably has priority.

Hylæus ugandicus, sp. n.

♂.—Length about 9·5 mm.

Robust, black, without any red ; clypeus, lateral face-marks, and supraclypeal mark deep orange, entirely dull, very punctured; lateral marks obliquely narrowed above, ending on orbits a short distance above level of antennæ, forming very broad triangles with apex at upper corner of clypeus, and the two sides about equal; supraclypeal mark broadly, squarely truncate above, broadened below; frontal keels between antennæ somewhat bowed outward; labrum black; mandibles black, slightly reddened apically, simple, but with blunt end; lower margin of clypeus black; antennæ black, the flagellum faintly brownish beneath toward apex; front dull; upper border of pronotum with a broadly interrupted yellow band, and tubercles yellow; mesonotum and scutellum very coarsely punctured; base of metathorax with coarse irregular rugæ; tegulæ bright chestnut-red posteriorly, but with a large black spot in front. Wings dilute fuliginous, stigma nearly black; basal nervure meeting nervulus; first recurrent nervure ending near end of first cubital cell. Legs black, with a band of silvery hair along middle basitarsi, and hind tibiæ with a silvery line posteriorly on about apical two-thirds. Abdomen excessively finely punctured, the punctures hardly visible under a lens; first tergite with a broad marginal band of pure white tomentum on each side, the other tergites with weak indications of greyish hair in the same region; venter shining, simple, except that the first sternite is elevated in middle and the third has a slight swelling on each side near the margin.

Uganda: Tero Forest, July 1912 (*C. C. Gowdey*).

This most resembles *Nothylæus fortis* Ckll., but the latter is less robust, with a narrower, somewhat shining face, and a callus on third sternite, while the mandibles are slender apically. I feel sure that they are closely related, and now think it is best to write *Hylæus fortis*.

Melitta turneri Brauns.

S.W. Africa: Swakopmund, April 2–4, ♀ (*R. E. Turner*).

I believe this cannot be separated as a species from *M. capensis* (Friese), the latter name being the prior and valid one.

Nomia basutorum Cockerell.

Cape Province: Katberg, 4000 ft., Jan. 1933 (*R. E. Turner*).

Colletes opaciventris Friese.

Cape Province: Katberg, Feb. 11–18, 1933, both sexes (*R. E. Turner*).

The male agrees with a co-type from Dunbrody. The broad second cubital cell receives the first recurrent nervure at the middle, and the sides of the cell are conspicuously oblique, converging above. This does not agree with the specimen labelled "Capland," received from Friese by the American Museum (see Am. Mus. Novitates, 856). The female is very like *C. martini* Ckll., but differs by the dull disc of mesonotum and the shorter malar space. The red tarsi and hind tibiæ distinguish it from *C. callaspis* Ckll., to which it runs in the table in Am. Mus. Novitates, 856 (1936).

Colletes volkmanni Friese.

Cape Province: Prince Albert Road, Nov. 1931, 4 ♀, 1 ♂ (*R. E. Turner*).

The female agrees with *C. volkmanni*; the male, which seems to belong here, has the hair of mesonotum white, of scutellum tinged with yellow, and the hind tibiæ are black. Both sexes carry Asclepiad pollinia on their legs.

Nomada fragilis mesosticta, subsp. n.

♂.—Anterior wing 7 mm. long.

Head broad; eyes greenish; face covered with silvery-white hair; clypeus, supraclypeal area, lateral face-marks, labrum, mandibles (except apex), band along lower half of posterior orbits, and the greatly swollen scape in front all sulphur-yellow; flagellum very long, black above, bright ferruginous beneath; third antennal joint very short, fourth very long, longer than thirteenth; flagellum rather weakly denticulate beneath; hair of thorax thin, white at sides and beneath, almost lacking above; prothorax with a transverse yellow band, interrupted in middle, but tubercles bright red; scutellum with two large round yellow spots, near together; postscutellum and metathorax black; mesopleura with a transverse, oblique, light yellow band; mesonotum entirely dull; tegulæ bright ferruginous. Wings long, darkened at apex; basal nervure going some distance basad of nervulus; second cubital cell large, nearly parallel-sided, receiving recurrent nervure a little beyond middle. Legs red, anterior femora and tibiæ pale yellowish in front, and with a dusky shade behind; middle femora with a black stripe beneath, not reaching apex, their tibiæ yellowish in front; hind coxæ black, red at apex, trochanters red; hind femora robust, broadly black beneath, their tibiæ and basitarsi blackish. Abdomen with entire yellow bands on tergites 1 to 6, on second very broad, but partly interrupted by a red mark, on third much narrowed in middle; intervals between the bands red and black; apical plate strongly notched; venter yellow and red. The first sternite in middle with a light yellow mark broadly bounded by black, but otherwise red.

California: Live Oak Canyon, Redlands, March 30, 1936 (*Alice Mackie*).

Very near to *N. fragilis* Cresson (specimen from Cheyenne Canyon, Colorado, May 11, compared), and probably to be regarded as a subspecies, differing by the supraclypeal mark, lateral face-marks broader above and less broadened below, scape more swollen, stigma darker.

Type in my collection.

Andrena subalia (Cockerell).

California: Live Oak Canyon, Redlands, at white *Ceanothus*, March 15, 1936 (*Alice Mackie*).

Described as a subspecies of *A. microchlora* Ckll., but probably to be regarded as a distinct species.

Andrena angustella quercina, subsp. n.

♂.—Head a little smaller; yellow clypeal mark not quite so high; some black hair on upper part of head, and scutellum with abundant very long erect black hair; mandibles with a distinct dentiform angle at base below; area of metathorax appreciably shining; margins of tergites not pallid, and without hair-bands. This is not a *Micrandrena*; the first intercubitus is remote from the large red stigma. The second cubital cell is narrow.

California: Live Oak Canyon, Redlands, at white *Ceanothus*, March 15, 1936 (*Alice Mackie*).

Type in my collection.

Systropha glabriventris Friese.

S. Rhodesia: Lonely Mine, 9 ♂, 4 ♀, Jan. 8 to March 15 (*H. Swale*).

The female, not described by Friese, resembles the male in all but the sexual characters; the abdomen beneath is thickly clothed with yellowish-white hair. The tongue is about 5·7 mm. long; the labial palpi have the first two joints in a straight line, the last two divergent, the last very slender. In the male the sixth and seventh tergites have lateral teeth.

Nomia viciniformis, sp. n.

♂.—Length about 11·5 mm., expanse of wings 21·5.

Robust, black, with the flagellum pale clay-colour beneath except at end, and the depressed hind margins of tergites broadly reddish testaceous, covered with greyish-white hair; head circular seen from in front; face and cheeks densely covered with white hair; antennæ long, the last joint black, and enlarged to a large flat plate; mesonotum and scutellum shining, well punctured; scutellum obtusely bigibbous; base of metathorax with a narrow band crossed by ridges; posterior truncation densely striate-punctate, except a large polished triangular area above; hair of thorax above very scanty, pale, a little dark hair on scutellum; tegulæ black, not enlarged. Wings hyaline, broadly fuscous at apex; stigma very dark brown; basal nervure meeting nervulus; second cubital cell very broad, receiving recurrent nervure about middle. Legs black, with pale hair; hind femora very stout, but not globose or toothed; hind basitarsi very broad, the anterior margin subangulate. Abdomen with thin pale hair and five hair-bands, the third and following bands overlapped by long black hairs; apex broadly truncate, somewhat concave, fringed with golden hair; venter shining.

Somaliland: Bohothe, 1903 (*Vet.-Major A. F. Appleton*).

N. lamellicornis Friese is allied, but differs by the clear red small joints of anterior and middle tarsi and the clear rufo-fulvous tegulæ. *N. vicina* Stadelm., which is very insufficiently described, differs by the dusky yellow hair of thorax above. Strand gives a few remarks on the venation of *N. vicina,* which so far as described agrees with the present species.

Nomia swalei, sp. n.

♂.—Length about 11 mm., anterior wing 8·5.

Robust, black, with the flagellum reddish clay-colour beneath except at end, and the depressed hind margins of tergites more or less testaceous, but densely covered with greyish-white tomentum; head circular seen from in front; face and cheeks densely covered with white hair, but the densely punctured lower margin of clypeus exposed; antennæ long, the last joint forming a black expanded plate; mesonotum and scutellum shining, well punctured; scutellum obtusely bigibbous; metathorax like that of *N. viciniformis*, except that the basal band is broader; hair of thorax dense and white at sides, on postscutellum, and forming a band in front of each axilla, but on mesonotum and scutellum it is short and pale grey; tegulæ normal, rufo-testaceous. Wings hyaline, fuscous at apex; basal nervure falling a little short of nervulus; second cubital cell very broad, receiving recurrent nervure about middle; stigma dusky red. Legs black, with the tarsi red at apex; hair of legs white, red on inner side of tarsi; hind femora stout, but not globose or toothed; hind tibiæ with a large broad dark brown apical lamella (in *N. viciniformis* there is a similar but shorter lamella); hind basitarsi slender; abdomen with five white hair-bands, the first slender; third and following tergites with some black hair; apex projecting, obtusely pointed, but beneath this is a fringe of pale fulvous hair. The apical structure is essentially the same as in *N. viciniformis*; in the type of the latter the apical plate is retracted.

S. Rhodesia (Matabeleland); Lonely Mine, 8 ♂♂, Dec. 3 to 26 (*H. Swale*). Some are marked A. Swale.

Closely allied to *N. vicinifo·mis*, but smaller, with whiter pubescence, and other differences as described.

XX.—*New or little-known* Tipulidæ (*Diptera*).—LVI. *Neotropical Species*. By CHARLES P. ALEXANDER, Ph.D., F.R.E.S., Massachusetts State College, Amherst, Massachusetts, U.S.A.

As was the case with the two preceding parts under this general title, in the present instalment I am considering only species taken in the Oriente of Ecuador. This rich material was secured by William Clarke-Macintyre, assisted by native collectors. I am very much indebted to the collectors for their interest in saving these fragile flies, the types of the novelties herein described being preserved in my collection of Tipulidæ.

Epiphragma (*Epiphragma*) *subsolatrix*, sp. n.

Mesonotal præscutum chiefly dark brown, the scutum, scutellum and mediotergite yellow pollinose; halteres chiefly pale yellow; legs yellow, each femur with two black rings on outer half; wings whitish subhyaline, irregularly fasciate with yellowish brown or tawny areas that are narrowly bordered by dark brown; male hypopygium with the interbasal rods slender, the extreme tips bent mesad into short points.

Male.—Length about 8–9 mm.; wing 10–11 mm.; antennæ 2·5–3 mm.

Female.—Length about 10–12 mm.; wing 10–12 mm.

Rostrum yellowish pollinose above, darker on sides; palpi black. Antennæ with scape and pedicel brown to dark brown; basal segment of flagellum yellow to obscure brownish yellow, the succeeding segments pale, outwardly passing into dark brown; verticils conspicuous. Head chiefly dark brown, the orbits more reddish brown.

Pronotum yellow. Mesonotal præscutum almost uniformly dark brown, the central portion of disk usually occupied by stripes being more reddish brown; extreme posterior border of præscutum, scutum, scutellum, and mediotergite more yellowish pollinose. Pleura chiefly dark brown, variegated with brownish yellow on ventral sternopleurite, the dark colour involving also the pleurotergite and lateral portions of mediotergite. Halteres chiefly pale yellow. Legs with the coxæ and trochanters yellow; femora yellow, each with two black rings, one placed close to mid-length, the other subterminal, these somewhat variable in extent, the outer subequal to the yellow interspace; in some individuals the extreme femoral tip is further darkened; tibiæ and tarsi light yellow. Wings with the ground-colour whitish subhyaline, irregularly fasciate with yellowish brown or tawny areas that are narrowly bordered by dark brown; bands before cord interconnected in the radial and anal fields; band at cord usually disconnected from the basal dark mass but, in cases, narrowly interconnected in outer end of cell *R*; a narrow oblique area of the white ground beyond the cord, almost completely traversing the wing, separated from the pale area before cord only in outer end of cell; beyond cord, the dark areas more or less restricted to the ends of the veins; more extensive dark areas at stigma, anterior cord and outer end of cell R_5; veins yellow, darker in the patterned areas. Venation: *Rs* only weakly angulated but usually short-spurred at origin; *m–cu* at basal third or fourth of cell *1st* M_2.

Abdominal tergites yellowish brown, the proximal rings of the more basal segments more brownish black, the caudal borders narrowly pale; sternites weakly bicoloured, brown, the caudal borders narrowly yellow; hypopygium brown. Male hypopygium with the interbasal rods slender, feebly bent at near mid-length, the extreme tips bent mesad into short points.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, September 20, 1937 (*Macintyre*). *Allotopotype*, ♀, pinned with type. *Paratopotypes*, ♂♀, November 1936, August 15 to September 20, 1937 (*Macintyre*).

In its wing pattern, *Epiphragma* (*Epiphragma*) *subsolatrix* is generally similar to *E.* (*E.*) *fascipennis* (Say) and *E.* (*E.*) *solatrix* (Osten Sacken), but differs conspicuously in the coloration, especially of the femora.

Epiphragma (*Epiphragma*) *nigroplagiata*, sp. n.

General coloration brown, the præscutum yellow with three brown stripes and two large polished black areas on either side; femora yellow with two narrow black rings, remainder of legs yellow; wings pale yellow with an ocellate brown pattern; *m–cu* at near one-third the length of cell; abdominal tergites dark brown, the sternites yellow, ringed with darker.

Male.—Length about 11 mm.; wing 12 mm.; antennæ about 4 mm.

Female.—Length about 13 mm.; wing 12·5 mm.

Rostrum yellow to brownish yellow; palpi black. Antennæ moderately long; scape brownish yellow; pedicel relatively long, dark brown; first flagellar segment light yellow, remainder of flagellum black; flagellar segments long-cylindrical, with conspicuous verticils. Head brownish yellow, the posterior portion of vertex with a transverse dark brown area.

Pronotum dark brown. Mesonotal præscutum with the ground-colour obscure yellow, polished in front, more pollinose near suture, the usual præscutal stripes dark brown, extensive; two major polished black areas on either side of præscutum, one at humeral area, the second larger, occupying the entire lateral margin of sclerite between the pseudosutural foveæ and suture; scutal lobes similarly polished black, the median area, together with the scutellum, pruinose; postnotum black, heavily grey pruinose. Pleura black, variegated with obscure brownish yellow on the dorsal sternopleurite and ventral pteropleurite; ventral sternopleurite dark brown. Halteres elongate, brown, the knobs a little paler. Legs with the coxæ blackened, the distal ends of fore coxæ yellow; trochanters yellow; femora yellow, with two black rings, one beyond mid-length, the other subapical, these rings relatively narrow, subequal in extent to the alternating yellow rings; tibiæ obscure yellow with an extensive pale brown ring just beyond base, this paling outwardly into the ground-colour; tarsi obscure yellow. Wings pale yellow, the costal portion more saturated; a heavy brown ocellate pattern, the area at origin of *Rs* not connected with the one at cord; a series of dark dashes in cell *2nd A*; veins brown, yellow in the ground areas. Venation: supernumerary cross-vein in cell *C* perpendicular; R_{2+3+4} subequal to *m–cu*, the latter at near one-third the length of cell *1st* M_2; cell M_1 a little longer than its petiole.

Abdominal tergites dark brown, at least the basal sternites yellow; in female, the bases of sternites narrowly but conspicuously ringed with brown. Male hypopygium with the outer dististyle strongly curved at apex; interbase relatively stout, the tip curved.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, March 29, 1937 (*Macintyre*). *Allotopotype*, ♀, September 21, 1937 (*Macintyre*).

Epiphragma (*Epiphragma*) *nigroplagiata* is readily told from all described species by the conspicuous pattern of the mesonotum.

Epiphragma (*Epiphragma*) *deliberata*, sp. n.

General coloration brownish black, the præscutal stripes reddish brown; antennæ short; basal and apical flagellar segments yellow, the remainder black; halteres dusky, the knob yellow; femora obscure brownish yellow on basal half, outer portion yellow, enclosing a broad black subterminal ring; tibiæ black, the base narrowly, the apex broadly yellow, most extensively so on posterior legs; tarsi yellow; wings yellow, with a heavy brown pattern, including about eight larger and darker costal areas, cells R_4, M and Cu more washed with brown; margin of 2nd anal cell with five dark areas; abdomen black, the intermediate sternites with broad, pale yellow, posterior margins.

Male.—Length about 6·5–8 mm.; wing 7–10 mm.

Female.—Length about 9–11 mm.; wing 8–11 mm.

Rostrum brownish black; palpi black. Antennæ short, black, basal fusion segment bright yellow; scape slightly pruinose; terminal flagellar segment paling to yellow. Head dark brown, the posterior orbits broadly obscure orange.

Mesonotal præscutum with the ground-colour dull black, most intense on the humeral and lateral portions; stripes more reddish brown, occupying virtually all of the disk, the posterior interspaces poorly delimited; median stripe more or less divided on anterior portion by a capillary dark vitta; posterior sclerites of notum black, pruinose, heaviest on the mediotergite. In some specimens the mesonotum is almost uniformly blackened. Pleura uniformly blackened. Halteres with stem dusky, knob pale yellow. Legs with the coxæ blackened; trochanters obscure yellow; femora with basal half obscure brownish yellow, deepening to a narrow brownish black ring just beyond mid-length; distal portion of femur bright yellow, enclosing a broad black ring that is nearly twice as wide as either the yellow apex or subterminal ring; tibiæ with base narrowly yellow, the intermediate portion black, the tips yellow, the latter narrowest (about the distal sixth) on fore legs, widest on hind tibiæ (distal three-fourths or approximately so); tarsi yellow. Wings with the ground-colour yellow, with a heavy brown pattern, including about eight larger and darker-coloured costal areas; areas at arculus, origin of *Rs* and fork of *Rs* ocellate; stigmal area solid; ground-colour of cells R_4, *M* and *Cu* extensively infumed, the centres of remaining interspaces basad of cord less distinctly clouded; outer radial cells with the ground-colour clear yellow; yellow marginal spots in radial and medial cells; cell *1st A* with three, *2nd A* with five marginal dark areas, excluding the spots at ends of veins; veins dark, a little brighter in the yellow ground areas. Venation: *Rs* relatively short, square and spurred at origin; R_{2+3+4} about one-half the length of *Rs*; *m–cu* at near mid-length of cell *1st* M_2.

Abdominal tergites and hypopygium dark brown to brownish black; sternites dark brown, the caudal borders of segments three to seven broadly and conspicuously pale yellow.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, April 7, 1937 (*Macintyre*). *Allotopotype*, ♀. *Paratopotypes*, 1 ♂, several ♀♀, April 5–18, September 21, 1937 (*Macintyre*).

Epiphragma (*Epiphragma*) *deliberata* is readily distinguished by the diagnostic features listed above, especially the coloration of the antennæ, legs and abdominal sternites.

Epiphragma (*Epiphragma*) *enixa*, sp. n.

General coloration of notum dark brown, with grey stripes; antennæ with scape and pedicel pale, terminal segment of flagellum paling to yellow; halteres yellow with the base of knob darkened; femora yellow with two clearly defined black rings at and beyond mid-length, the remainder of legs yellow; wings pale yellow, patterned with brown; a series of about ten brown spots in cell *Cu*; abdominal tergites brown; sternites pale ochreous with dark brown incisures; male hypoygium with the interbase a slender curved spinous rod.

Male.—Length about 10 mm.; wing 11·5 mm.; antennæ about 3 mm.

Rostrum brown, pruinose; palpi black. Antennæ of moderate length, if bent backward extending about to wing-root or slightly beyond; scape obscure yellow; pedicel yellowish brown; first flagellar segment clear yellow, remainder of flagellum black, the terminal segments paling to yellow; flagellar segments subcylindrical, with unusually long verticils. Head buffy brown, the anterior vertex with a conspicuous chestnut-brown area; posterior vertex with a dusky median line.

Pronotum brownish yellow, with a capillary dark line. Mesonotal præscutum with grey stripes, the interspaces interruptedly dark brown; lateral margin of præscutum narrowly blackened; posterior sclerites of notum chiefly pruinose, each scutal lobe darkened medially; a black spot on side of scutum behind suture; scutellum black, thinly pruinose; mediotergite black, more heavily pruinose on sides. Pleura variegated brownish black and obscure brownish yellow, the former including the propleura, mesepisternum, pleurotergite and meron, the latter colour including the mesepimeron and sclerites ventrad of base of halteres. Halteres pale yellow, the base of knob darkened. Legs with the coxæ obscure yellow, the fore and middle coxæ restrictedly darkened medially; trochanters yellow; femora yellow, with two narrow, clearly defined black rings at and beyond mid-length, these narrower than the yellow apex and subterminal ring enclosed by them; tibiæ and tarsi uniformly yellow. Wings with the ground-colour pale yellow, conspicuously patterned with brown, including a series of seven or eight darker brown costal areas; areas at origin of *Rs*, cord, forks of R_{2+3+4} and M_{1+2}, *m* and stigma ocelliform; a linear series of about ten brown spots in cell *Cu*; margin of cell *1st A* with two dark areas, of *2nd A* with six areas, additional to those at ends of veins; veins yellow, darker in the clouded areas. Venation: R_{2+3+4} longer than *m–cu*, the latter before mid-length of cell *1st* M_2.

Abdominal tergites brown; sternites pale ochreous, the incisures narrowly dark brown; hypopygium more yellowish brown. Male hypopygium with the interbases appearing as slender simple rods, the curved tips acute.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, March 29, 1937 (*Macintyre*). *Paratopotype*, sex ? September 21, 1937 (*Macintyre*).

Epiphragma (*Epiphragma*) *enixa* is generally similar to *E.* (*E.*) *deliberata*, sp. n., differing conspicuously in the coloration of the body, legs, and wings. Both species have at least the terminal segment of the antennal flagellum pale yellow.

Epiphragma (*Epiphragma*) *subenixa*, sp. n.

General coloration of mesonotum dark brown, the præscutum with four reddish orange stripes ; antennæ black, the basal segment of flagellum orange ; pleura and pleurotergite almost uniform brownish yellow, without markings ; legs with coxæ uniformly pale, femora yellow with two black rings on outer half ; wings yellow, heavily patterned with brown, the markings in part ocelliform ; cell *Cu* without dark areas except at outer end ; abdomen dark brown, the basal sternites variegated with yellow ; male hypopygium with the interbase bent at a right-angle before apex.

Male.—Length about 9·5 mm. ; wing 10·5 mm. ; antennæ about 3 mm.

Rostrum reddish brown ; palpi black. Antennæ moderately long, if bent backward extending about to wing-root or shortly beyond ; scape and pedicel black ; basal segment of flagellum orange, with white pubescence, remainder of flagellum black ; flagellar segments nearly cylindrical, with long conspicuous verticils. Head deep orange, the central portion of vertex extensively darker.

Mesonotal præscutum with the ground-colour dark brown, with four more reddish orange stripes, the intermediate pair separated by a capillary dark vitta ; scutum and mediotergite dark brown, the surface sparsely pruinose, the scutellum more testaceous yellow. Pleura and pleurotergite almost uniformly brownish yellow, without markings. Halteres uniformly infuscated. Legs with the coxæ uniformly brownish yellow to obscure yellow ; trochanters yellow ; femora yellow, with two narrow black rings, the narrower one just beyond mid-length, the outer dark ring subterminal, nearly twice as wide as the inner and subequal to either the yellow apex or yellow subterminal ring; tibiæ and tarsi uniformly yellow. Wings with the ground-colour yellow, more saturated in the prearcular and costal fields; a heavy brown pattern, including about eight darker costal areas; a distinct ocellus surrounding origin of *Rs*, with more-broken and less-evident ocelli centreing at anterior cord and fork of M_{1+2}; stigmal area solidly darkened; ground-colour of cells R_4, R_5, *Cu* and *1st A* suffused with dusky; dark spots in cell *Cu* lacking or confined to outer end; outer end of cell *1st A* with a single dark area between veins, cell *2nd A* with about six such marginal areas; veins pale brown, yellow in the flavous areas. Venation: *Rs* nearly square at origin; R_{2+3+4} shorter than R_{2+3}; *m–cu* at mid-length of cell *1st* M_2.

Abdominal tergites dark brown; third and succeeding sternites with posterior borders conspicuously yellow; second sternite with this band subapical; hypopygium brownish yellow. Male hypopygium with the interbase bent at a right-angle before apex.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, September 20, 1937 (*Macintyre*).

Epiphragma (*Epiphragma*) *subenixa*, while generally similar to *E.* (*E.*) *enixa*, sp. n., is entirely distinct in all details of coloration of body and wings, and in the structure of the interbasal rods of the male hypopygium.

Epiphragma (*Epiphragma*) *diadema*, sp. n.

General coloration of mesonotum dark brown, the usual præscutal stripes deep chestnut-brown, the intermediate pair dark brown on posterior half; antennal flagellum beyond the first segment uniformly black; scutellum and median area of scutum pale; pleura yellow, striped longitudinally with dark brown, including a broad dorsal stripe from the cervical region to the pleurotergite, sternopleurite and meron abruptly pale; legs yellow, the femora with two broad black rings; wings yellow, heavily patterned with brown, the areas partly ocelliform; abdominal tergites beyond the first brownish black.

Male.—Length about 11 mm.; wing 12 mm.; antennæ about 3·3 mm.

Female.—Length about 12–14 mm.; wing 11–12 mm.

Rostrum ochraceous; palpi black. Antennæ of moderate length, in male if bent backward ending shortly before wing-root; scape yellow, pedicel dark brown, paler basally; first flagellar segment light orange, remainder of flagellum uniformly black, the segments with conspicuous verticils. Head with front and anterior vertex pale; remainder of head deep chestnut-brown, the central portion of vertex more infuscated.

Pronotum dark brown medially and on ventral portions, the sublateral region broadly yellow, confluent behind with the pale dorsopleural region. Mesonotal præscutum with most of the usual stripes medium brown to chestnut-brown, vaguely separated by darker lines, the humeral and lateral portions brownish black; posterior half of intermediate præscutal stripes darkened; scutal lobes extensively dark brown, the median area pale; scutellum pale, the parascutella dark; mediotergite with central portion grey pruinose, the borders darkened. Pleura yellow, striped longitudinally with dark brown, including a dorsal stripe from the cervical region to the pleurotergite, the centre of the latter pale; a more ventral dark stripe, involving chiefly the mid-coxæ; pale ground stripes occupying the dorsopleural region and the sternopleural and meral portions. Halteres pale, the base of knob infuscated, the apex a little paler. Legs with the fore coxæ yellow to more or less infuscated; mid-coxæ blackened; posterior coxæ obscure yellow; trochanters yellow; femora yellow, with two broad black rings at and beyond mid-length; tibiæ and tarsi yellow. Wings yellow, the costal portion more saturated; a heavy brown pattern, darker along the costal border; ocelliform areas centering at origin of *Rs*, anterior cord and fork of M_{1+2}; dark areas in cell *Cu* few and restricted to outer end of cell, the basal half washed with darker; dark marginal spots at outer end of cell *1st A* varying in number from one to three, in cell *2nd A* four or five; veins yellow, darker in the clouded areas. Venation: R_{2+3+4} and R_{2+3} subequal; *m–cu* at or before mid-length of cell *1st* M_2.

Abdominal tergites beyond the first brownish black; basal sternites more uniformly yellow; hypopygium obscure yellow. Male hypopygium with the tergal lobes low and broad. Interbasal rods relatively short, at apex curved laterad into acute points.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, August 15, 1937 (*Macintyre*). *Allotopotype*, ♀, April 4, 1937. *Paratopotype*, ♀, September 20, 1937 (*Macintyre*).

Epiphragma (*Epiphragma*) *diadema* is closest to *E.* (*E.*) *enixa*, sp. n., and *E.* (*E.*) *subenixa*, sp. n., differing especially in the pattern of the mesonotal præscutum and pleura. It is certain that there are numerous generally similar but quite distinct species within this particular complex of forms.

Epiphragma (*Epiphragma*) *xanthomela*, sp. n.

General coloration black, the præscutum variegated with dark brown; antennæ elongate, black, the first flagellar segment orange; femora black, the base, apex and a subterminal ring narrowly yellow; tibiæ yellow at extreme base, followed by a broad black ring, the tip yellow; tarsi yellow; wings pale yellow, with a heavy brown pattern, including large ocelliform areas; abdominal tergites black, the caudal borders restrictedly silvery; sternites with posterior borders broadly yellow.

Female.—Length about 10 mm.; wing 9 mm.; antennæ about 3·3 mm.

Rostrum and palpi black. Antennæ black, the basal segment of flagellum abruptly orange; antennæ relatively long, especially for the female sex, if bent backward extending to shortly beyond base of abdomen; flagellar segments cylindrical, with conspicuous verticils. Head dark brown, the front and narrow orbits somewhat more reddish brown, the posterior vertex and genæ slightly more pruinose.

Pronotum obscure yellow, the anterior notum and pleura more infuscated; pretergites obscure yellow. Mesonotal præscutum with the disk chiefly light brown, variegated with black, including a conspicuous median vitta and broad lateral and cephalic borders, slightly interrupted at the humeri; scutum with the ground-colour brownish yellow pollinose, each lobe with disk extensively darkened, the median line with a narrow vitta; scutellum and mediotergite black, sparsely pruinose. Pleura and pleurotergite chiefly black, including the dorsopleural region, the meral area a trifle paler. Halteres moderately long, infuscated, the base of stem and apex of knob obscure yellow. Legs with the coxæ black, the tips narrowly yellow, of the fore coxæ the distal half more piceous; trochanters brownish black; femora black, the bases narrowly yellow, somewhat more extensively so on posterior legs; a narrow ring at near two-thirds to three-fourths the length, together with the apex, yellow, the black subterminal ring very broad; tibiæ extensively black on proximal portion, the extreme base yellow, the dark colour most extensive on the fore and middle tibiæ where more than three-fourths the total length is included, narrower on posterior legs where about one-half the length is involved; tips of tibiæ and all tarsi yellow. Wings relatively narrow, pale yellow, the costal border more saturated yellow; a heavy brown pattern, including about eight darker costal areas that are more extensive than the interspaces, especially the more basal ones; ocellate rings centreing at origin of *Rs*, cord and fork of M_{1+2}, with a further incomplete ocellus at arculus, the rings large, enclosing extensive pale areas; stigmal area not ocelliform; cells *Cu* and 1*st A* clouded, the former with only one or two darker areas; cell 1*st A* with four marginal darkenings, cell 2*nd A* with about eight, excluding the areas at ends of veins; veins brown, yellow in the flavous areas. Venation: *m–cu* at near two-thirds the length of cell 1*st* M_2.

Abdominal tergites black, the caudal margins of the segments restrictedly silvery; sternites similar, the posterior margins more broadly and conspicuously yellow.

Hab. Ecuador (Oriente).

Holotype, ♀, Abitagua, altitude 1200 metres, April 5, 1937 (*Macintyre*).

In its general appearance, especially the blackened tibiæ, *Epiphragma* (*Epiphragma*) *xanthomela* is most similar to *E.* (*E.*) *deliberata*, sp. n., but is entirely distinct. The unusually long antennæ of the female indicate an even longer organ in the male.

Epiphragma (*Epiphragma*) *oxyphallus*, sp. n.

General coloration of præscutum bright brown; antennæ with basal three or four segments pale, the remainder black; pronotum and dorsopleural membrane obscure yellow, the remainder of pleura black, including the broad bases of the coxæ; halteres relatively long, infuscated; legs yellow, the femora with a narrow brown subterminal ring; wings yellow, the ground-colour more or less washed with brown, heavily patterned with darker brown, the markings in part ocelliform; male hypopygium with the ædeagus a flattened compressed blade, narrowed into a long apical point, protruding ventrad and cephalad from the genital chamber.

Male.—Length about 8–8·5 mm.; wing 9–9·5 mm.; antennæ about 2·8–3 mm.

Female.—Length about 9–10 mm.; wing 9·5–10·5 mm.

Rostrum brownish black; palpi black. Antennæ with the basal three or four segments yellow, the scape sometimes a trifle darker; remainder of flagellum black. Head brownish grey, the posterior vertex with a darker median line; front and narrow posterior orbits more yellow.

Pronotum obscure yellow, with a narrow median vitta. Mesonotal præscutum with the stripes bright brown, the interspaces dark brown to brownish black, most conspicuous on lateral margins behind the pseudosutural foveæ and less evidently on anterior portion of sclerite; posterior interspaces and median dark vitta sometimes restricted and virtually confluent with the ground; scutum reddish brown, the lobes darkened; scutellum dark; mediotergite dark medially, the caudal and lateral portions obscure yellow. Pleura and pleurotergite black, only the dorsopleural region abruptly yellow. Halteres relatively elongate, infuscated. Legs with the coxæ blackened, the tips abruptly yellow, involving about the distal half on middle and posterior legs, narrower on fore pair; trochanters yellow; femora brownish yellow, clearer yellow at base and tip, with a narrow brown subterminal ring; tibiæ and tarsi yellow. Wings with the ground-colour yellow, more saturated in costal portion; much of disk washed with brown but not forming distinct pale-margined centres to the interspaces as in many species, the most conspicuous darkening involving the outer radial field and cells *M*, *Cu*, *1st A* and *2nd A*; a heavy brown pattern, including about eight still darker brown costal areas; ocellate areas centreing at origin of *Rs* and cord; stigmal area solid;

an irregular series of more or less confluent dark spots in cell *Cu*; dark marginal spots at ends of longitudinal veins, in cases confluent along extreme outer margin but leaving central pale droplets at ends of cells; outer end of cell *1st A* with two or three, of *2nd A* with from six to eight dark spots, additional to areas on the veins themselves; veins pale brown, darker in the heavily patterned areas, yellower in the flavous portions. Venation: *Rs* angulated and spurred at origin; *m–cu* before mid-length of cell *1st* M_2.

Abdominal tergites brownish black, the incisures somewhat brightened; sternites more obscure yellow, variegated with darker, the lateral portions blackened; hypopygium brownish yellow. Male hypopygium with the tergal lobes long and slender. Outer dististyle with a distinct lobe or shoulder on outer margin near base, the style gradually narrowed outwardly into a long curved point. Ædeagus entirely different from the type normal in the genus, appearing as a flattened compressed blade that narrows to a slender tip, in a position of rest directed ventrad and cephalad, showing conspicuously even with a hand lens.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, September 18, 1937 (*Macintyre*). *Allotopotype*, ♀, in copula with type. *Paratopotypes*, several males and females, March 23 to April 20, 1937; August 20, 1937; September 18–20, 1937 (*Macintyre*).

In the peculiar and somewhat remarkable ædeagus, the present fly is entirely distinct from all regional species of the genus so far described.

Epiphragma (*Epiphragma*) *hirtistylata*, sp. n.

General coloration of notum obscure yellow, patterned with brown; terminal segments of maxillary palpi and antennæ abruptly yellow; antennæ elongate, the basal flagellar segments bicoloured; halteres elongate, obscure yellow; femora black; tibiæ black, the tips yellow; tarsi yellow; wings pale yellow, all cells abundantly dotted with brown, with about seven slightly larger areas that are costal in distribution; *m–cu* shortly before mid-length of cell *1st* M_2; male hypopygium with the outer face of basistyle with unusually long and conspicuous setæ.

Male.—Length about 9·5–10 mm.; wing 9·5–10·5 mm.; antennæ about 4·2 mm.

Rostrum black; palpi black, the terminal segment abruptly yellow. Antennæ (male) elongate, if bent backward extending to about base of third abdominal segment; basal four segments yellow, the succeeding three bicolorous, the base narrowly black, the apex yellow, with the amount of black becoming more extensive on outer segments; outer half of flagellum black, the small terminal segment abruptly pale yellow; flagellar segments long-cylindrical, with conspicuous erect setæ and sparse longer verticils. Head light orange.

Pronotum yellow, narrowly darkened medially. Mesonotal præscutum obscure yellow, restrictedly patterned with brown, including the lateral and cephalic borders and less distinct discal markings; an inverted V-shaped brown marking at mid-length of præscutum, behind which the median area is more pruinose, bordered laterally by brown; scutal lobes weakly darkened; scutellum and mediotergite brown, pruinose, especially the latter. Pleura obscure yellow, with a conspicuous dark brown longitudinal stripe extending from the cervical region, passing above the fore coxæ to base of halteres and pleurotergite, its dorsal edge sharply defined. Halteres elongate, obscure yellow. Legs with the fore coxæ chiefly infuscated, remaining coxæ yellow; trochanters brown; femora black; tibiæ black, the tips abruptly yellow, including about the distal fourth or fifth, more extensive on posterior legs; tarsi yellow. Wings pale yellow, all cells abundantly dotted with brown, with about seven slightly larger areas that are costally arranged, the second at origin of *Rs*, third at the supernumerary cross-vein in cell *C*, fourth at fork of *Sc*; last area at end of vein R_4; more restricted seams along cord, outer end of cell 1*st* M_2, fork of M_{1+2} and ends of the longitudinal veins; the only indication of the usual ocellate pattern common in the genus includes an area surrounding the origin of *Rs*; veins yellow, darker in the clouded areas. Venation: R_{1+2} and R_2 subequal; *Rs* nearly square at origin; petiole of cell M_1 from about one-half to two-thirds the cell; *m–cu* shortly before mid-length of cell 1*st* M_2.

Abdominal tergites medium brown; sternites yellow, ringed with brown on basal portions; hypopygium brown.

Male hypopygium with the basistyle provided with unusually long and strong setæ on outer face of distal half, these hairs exceeding in length the basistyle itself; shorter strong setæ on proximal half of mesal face of basistyle. Dististyles relatively small, the outer terminating in a simple hook. Interbase with the lobe relatively short, the tip appearing as a short acute spine.

Hab. Ecuador (Oriente).

Holotype ♂, Abitagua, altitude 1200 metres, September 22, 1937 (*Macintyre*). *Paratopotypes*, 2 ♂♂, April 18–20, 1937 (*Macintyre*).

Epiphragma (*Epiphragma*) *hirtistylata* is so distinct from all other described species that any comparison with others is unnecessary.

Austrolimnophila persessilis, sp. n.

General coloration of præscutum grey, with three brown stripes; scape light yellow; pleura pale yellow; legs yellow; wings subhyaline, the stigma very pale brown; very pale brown clouds at origin of *Rs*, along cord and on outer end of cell 1*st* M_2; cell M_1 broadly sessile; *m–cu* at near one-third the length of cell 1*st* M_2; abdominal tergites weakly bicolorous, dark brown, the caudal margins of the segments narrowly obscure yellow.

Female.—Length about 8·5 mm.; wing 8·5 mm.

Rostrum yellow; palpi brownish black, the basal segment yellow. Antennæ with scape light yellow; pedicel pale brown; flagellum dark brown; flagellar segments cylindrical, with conspicuous verticils that exceed the segments in length; segments gradually increasing in length outwardly. Head brownish grey, the occiput obscure yellow.

Pronotum pale yellow. Mesonotal præscutum with the ground-colour grey chiefly concealed by three dark brown stripes, the laterals less clearly delimited, the interspaces poorly defined; scutal lobes dark brown, the median region a little paler; posterior sclerites of notum dark brown. Pleura pale yellow, the pleurotergite a little darker. Halteres very long, pale, the knobs weakly darkened. Legs with the coxæ and trochanters pale yellow; remainder of legs uniformly yellow, the terminal segments weakly infuscated; claws small, simple. Wings subhyaline; stigma long-oval, very pale brown; scarcely evident clouds at origin of *Rs*, along cord and at outer end of cell 1*st* M_2; veins dark brown. Macrotrichia of veins relatively short. Venation: *Sc* long, Sc_1 ending about opposite fork of R_{2+3+4}, Sc_2 longer at its tip; R_{1+2} a little longer than R_2; R_{2+3+4} relatively short, less than twice *r–m*; cell M_1 broadly sessile, *m* on vein M_2 about one-half its length beyond fork of M_{1+2}; *m–cu* at near one-third the length of cell 1*st* M_2.

Abdominal tergites weakly bicoloured, dark brown, the caudal margins of the segments narrowly obscure yellow; sternites obscure yellow; cerci strongly upcurved, horn-yellow.

Hab. Ecuador (Oriente).

Holotype, ♀, Abitagua, altitude 1200 metres, September 21, 1937 (*Macintyre*).

Austrolimnophila persessilis is very distinct from the other species so far described. In the sessile cell M_1 it resembles *A. pacifera* Alexander, of Brazil, but in all other respects is quite distinct.

Austrolimnophila nematocera, sp. n.

General coloration brownish black; antennæ (male) equal in length to the wing; flagellar segments long-cylindrical, with numerous long scattered verticils; wings obscure yellow, the colour almost obliterated by five broad transverse brown bands; *Sc* long, Sc_1 ending beyond fork of R_{2+3+4}, cell M_1 present; male hypopygium with the outer dististyle terminating in two small teeth.

Male.—Length about 6 mm.; wing 6 mm.; antennæ about 6 mm.

Rostrum and palpi black. Antennæ (male) of unusual length, subequal to the body or wing, brown throughout or the outer segments a trifle paler; flagellar segments long-cylindrical, with numerous long scattered verticils that are about two-thirds as long as the segments; terminal segment shorter. Head brownish black.

Pronotum and mesonotum almost uniformly brownish black, without clearly defined markings. Pleura similarly darkened, the ventral sclerites a trifle paler. Halteres with stem pale, knob dark brown. Legs with the coxæ testaceous, the fore pair darker; trochanters obscure yellow; femora and tibiæ dark brown, the tarsi a little paler. Wings with the ground-colour obscure yellow, almost obliterated by five broad transverse brown bands; first band prearcular, almost confluent with the second; third band at level of origin of *Rs* and end of *2nd A*, somewhat paler and broken in cell *M* and here interconnected with second band; fourth band at cord; outermost band occupying the broad apex, a little variegated by pale spots; veins brown, with conspicuous trichia. Venation: *Sc* long, Sc_1 ending beyond fork of R_{2+3+4}, Sc_2 near its tip; *Rs* long, angulated at origin, in alignment with R_{2+3+4}; basal section of R_5 and *r–m* in transverse alignment; cell M_1 subequal in length to its petiole; cell *1st* M_2 long and narrow, with *m–cu* at near two-fifths its length; anterior arculus broken.

Abdomen, including hypopygium, black. Male hypopygium with the outer dististyle small, subcylindrical, the apex with two small teeth, the outer more slender; surface of style with numerous coarse setæ. Inner dististyle small, terminating in a short obtuse point. Ædeagus short.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, August 20, 1937 (*Macintyre*).

I am referring the present fly to *Austrolimnophila* on the basis of the broken arculus, though with much question. The fly is quite different from any hitherto described species, especially in the elongate antennæ and unusually heavily banded wings.

Pseudolimnophila pluto, sp. n.

General coloration brownish black; antennæ black, the pedicel brownish yellow; halteres obscure yellow; legs brown, the tarsi paling to yellow; wings very strongly suffused with brown, stigma and seams on cord and outer end of cell *1st* M_2 darker brown; R_{2+3+4} short; veins R_3 and R_4 extending generally parallel to one another, so cell R_2 at margin is very wide; *m–cu* at from one-half to two-thirds the length of cell *1st* M_2.

Male.—Length about 7–7·5 mm.; wing 7·5–8 mm.; antennæ about 1·5 mm.

Female.—Length about 9 mm.; wing 8·5 mm.

Rostrum moderately long, about one-third the remainder of head, black throughout; palpi black. Antennæ with scape and flagellum black, pedicel brownish yellow; flagellar segments oval to long-oval, the verticils relatively long and conspicuous; terminal segment longer than the penultimate. Head brownish black; anterior vertex about one-third the width of front.

Thorax uniformly brownish black. Halteres obscure yellow, the base of stem a little darkened. Legs with the coxæ black to brownish black; trochanters yellow; femora and tibiæ brown, the tarsi paling to yellow. Wings very strongly suffused with brown, cell *Sc* above the arculus restrictedly more yellowish; stigma elongate, darker brown; darker seams along cord and outer end of cell 1*st* M_2; paler longitudinal streaks in cells *R* and *M*; veins dark brown, paler on basal third of wing. Macrotrichia of veins abundant, long and conspicuous. Venation: Sc_1 ending just beyond fork of *Rs*, Sc_2 at tip; R_{2+3+4} in longitudinal alignment with *Rs*, shorter than R_{2+3} and about twice the basal section of R_5; R_{1+2} from one and one-half to two times R_2; tip of vein R_3 bent strongly toward wing-tip, greatly widening cell R_2, veins R_3 and R_4 thus extending generally parallel to one another throughout their lengths; cell M_1 approximately twice its petiole; *m–cu* from one-half to two-thirds the length of the small cell 1*st* M_2; anterior arculus present.

Abdomen brownish black, the sternites, and in cases, the intermediate tergites, a little paler; hypopygium brownish yellow. Male hypopygium with the outer dististyle a simple rod, its tip a gently curved spine; surface of style with abundant setæ on mesal face, the ventral margin before apex with several appressed teeth. Inner dististyle small.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, April 20, 1937 (*Macintyre*). *Allotopotype*, ♀, April 7, 1937. *Paratopotype*, ♂, with the allotype.

Pseudolimnophila pluto is entirely distinct from all other species of the Limnophilaria in the Neotropical fauna. Superficially it most resembles *Limnophila charon* Alexander, of southern Brazil, but may be told readily by the venation and structure of the male hypopygium.

Polymera (*Polymera*) *clausa*, sp. n.

General coloration of mesonotum testaceous brown; pleura yellow, with a broad black dorsal stripe; antennæ (male) subequal to or longer than body, flagellum black, the segments binodose; halteres and legs black; wings with a uniform brown tinge, unpatterned; R_{2+3+4} short, about twice *r–m*; cell 1*st* M_2 closed, cell M_1 present; abdomen black, hypopygium yellowish brown.

Male.—Length about 6 mm.; wing 7 mm.; antennæ about 6 mm.

Female.—Length about 7 mm.; wing 6·5–7 mm.; antennæ about 2·5–2·6 mm.

Rostrum and palpi black. Antennæ black throughout, in male approximately as long as or slightly longer than body; flagellar segments weakly binodose; in female, antennæ short and normal for this sex. Head dark brownish grey.

Mesonotum uniformly light testaceous brown. Pleura with a broad black dorsal stripe extending from the cervical region to the base of abdomen; ventral pleurites pale yellow. Halteres dark throughout. Legs with the coxæ and trochanters yellow; femora dark brown, the bases narrowly obscure yellow; tibiæ and all tarsi black. Wings with a uniform brown tinge, unpatterned, the costal border a trifle more yellowish; veins and trichia brown. Venation: Sc_1 ending shortly before fork of R_{2+3+4}, Sc_2 near its tip; R_{1+2} approximately two-thirds *Rs* and from two-thirds to three-fourths R_{2+3}; R_{2+3+4} short, about twice *r–m*; cell M_1 present; cell 1*st* M_2 closed by the retention of *m*, the cell long and narrow; *m–cu* about its own length, or slightly less, beyond the fork of *M*.

Abdomen black; hypopygium yellowish brown.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, September 18, 1937 (*Macintyre*). *Allotopotype*, ♀. *Paratopotypes*, 3 ♀♀, September 18–22, 1937 (*Macintyre*).

Polymera (*Polymera*) *clausa* is readily told from all known members of the genus by the closed cell 1*st* M_2 of the wings. The uniformly blackened antennæ and tarsi, in conjunction with the presence of cell M_1 of the wings, similarly distinguishes the fly from most of its relatives.

Polymera (*Polymera*) *albogenualis*, sp. n.

General coloration of mesonotum cinnamon brown, unmarked; antennæ (male) very long, more than one-half longer than body, the flagellar segments binodose; femora dark brown, the tips narrowly and abruptly white; tarsi dirty brownish white; wings tinged with grey; R_{2+3+4} short, about one-fifth the length of vein R_{2+3}; R_{1+2} a little shorter than *Rs* and about three times *m–cu*; abdomen, including hypopygium, black.

Male.—Length about 6 mm.; wing 7 mm.; antennæ about 10 mm.

Rostrum obscure yellow; palpi testaceous brown. Antennæ very long, more than one-half longer than the body; scape brown, pedicel brownish yellow; flagellar segments pale brown, the tips narrowly pale; flagellar segments elongate, binodose, with very long outspreading verticils on both nodes. Head dark brownish grey.

Mesonotum uniformly light cinnamon brown, unmarked. Pleura with a broad brownish black longitudinal stripe on dorsal portion, the sternopleurite and meron abruptly light yellow. Halteres pale brownish yellow. Legs with the fore coxæ darkened basally, yellow at tips; remaining coxæ and all trochanters light yellow; femora dark brown, the bases a little paler, the tips narrowly (about 0·3 mm.) but conspicuously white, the amount subequal on all legs; tibiæ brown, the extreme tips very narrowly and insensibly paler; all tarsi paling to dirty brownish white. Wings with a greyish tinge, unmarked; veins and trichia darker. Venation: R_{2+3+4} only a little longer than basal section of R_5 and about one-fifth the length of vein R_{2+3} alone; R_{1+2} about three times R_{2+3+4} and only a little shorter than *Rs*; cell M_1 present; *m–cu* at fork of *M*.

Abdomen, including hypopygium, black.

Hab. Ecuador (Oriente).

Holotype, ♂, Rio Blanco, near Baños, Tungurahua, altitude 1700 metres, June 2, 1937 (*Macintyre*).

The most similar species is *Polymera* (*Polymera*) *albogeniculata* Alexander, likewise from Ecuador, which has the femoral tips similarly whitened, differing in the patterned præscutum and scutum and in the venational details, as the long R_{2+3+4}, which is about two-thirds as long as R_{2+3}.

Atarba (*Atarba*) *idonea*, sp. n.

General coloration brown, the præscutum more reddish brown; antennæ (male) very long, nearly as long as body; flagellum black throughout, the longest verticils solitary on each segment, unilaterally arranged; legs yellow; wings with a weak brown tinge, stigma pale brown; cell R_2 at margin wider than cell R_3; *m–cu* shortly before mid-length of the rectangular cell 1*st* M_2; abdominal tergites brownish black, hypopygium yellow; male hypopygium with the ædeagus relatively short and stout, parallel-sided, the apex not expanded.

Male.—Length about 4·5 mm.; wing 5 mm.; antennæ about 4 mm.

Rostrum brown; palpi dark brown. Antennæ (male) very long, nearly equal in length to the body; scape and pedicel pale brown, flagellum black; flagellar segments long-cylindrical, clothed with abundant long erect pale setæ; each segment with a single powerful seta, subequal in length to the segment, inserted on basal half of segment, unilaterally arranged; terminal segment about one-third the penultimate. Head dark brown.

Mesonotum almost uniform brown, the præscutum somewhat more reddish brown, the posterior sclerites darker. Pleura brown, the sternopleurite obscure yellow. Halteres dusky, the extreme base of stem pale. Legs with the coxæ and trochanters pale brown; remainder of legs yellow, the terminal tarsal segments more infuscated; no darkening of femoral tips. Wings with a weak brownish tinge, the prearcular and costal borders more yellowish; stigma pale brown, ill-defined; veins brown. Venation: *Sc* short, Sc_1 ending opposite origin of *Rs* or virtually so, Sc_2 close to tip; *Rs* unusually short, only a little longer than basal section of R_5; branches of *Rs* generally parallel to one another so cell R_2 at margin is wider than cell R_3; cell 1*st* M_2 rectangular, *m–cu* shortly before mid-length. In *brunneicornis* the branches of *Rs* diverge at tips so cell R_3 at margin is considerably more extensive than R_2.

Abdominal tergites dark brown to brownish black, the sternites a little more yellowish brown; hypopygium yellow. Sternal plate of male hypopygium with short lateral spines, the caudal margin truncate. Basistyle with a conspicuous interbasal lobe. Outer dististyle dilated beyond mid-length, thence narrowed into a slender point, the spines of outer margin about eight in number, on the apical point with only a single spine before the bifid apex ; face of style with supplementary roughenings and spinulæ. Inner distyle relatively stout, gently curved. Ædeagus short and stout, parallel-sided, the apex not expanded.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, April 5, 1937 (*Macintyre*).

The nearest ally is *Atarba* (*Atarba*) *brunneicornis* Alexander, of Colombia, which is readily told by the venation and by the structure of the male hypopygium.

Atarba (*Atarba*) *nodulosa*, sp. n.

Belongs to the *cincticornis* group ; general coloration of præscutum testaceous yellow ; antennæ (male) elongate, subequal in length to body, bicoloured, the bases of the flagellar segments black, conspicuously swollen, producing a nodulose appearance ; legs yellow ; wings yellow, with a restricted brown pattern ; Sc_1 ending about opposite one-third the length of the relatively long *Rs*, *m–cu* close to mid-length of the rectangular cell *1st* M_2 ; male hypopygium with the ædeagus angularly bent at near two-thirds the length and here provided with a spinous point.

Male.—Length about 5·5 mm. ; wing 6 mm. ; antennæ about 5·5 mm.

Rostrum brown ; palpi with basal segment yellow, outer segments black. Antennæ (male) elongate, approximately as long as body ; scape, pedicel and first flagellar segment pale yellow ; succeeding segments bicolored, yellow, the basal half black, conspicuously swollen, about twice as thick as the apical portion, with long conspicuous verticils. Head greyish brown ; eyes large ; anterior vertex greatly reduced, not exceeding one-half the diameter of the scape.

Mesonotal præscutum and scutum testaceous yellow, the lateral margin narrowly darkened ; posterior sclerites of notum darker. Pleura testaceous yellow, the dorsopleural region more darkened. Halteres pale. Legs with the coxæ and trochanters yellow ; remainder of legs yellow, the outer tarsal segments darkened. Wings yellow, restrictedly patterned with brown, including the stigma and a narrow vague seam along cord, the latter chiefly indicated by the darker veins; veins yellow, except as described. Venation: Sc_1 ending about opposite one-third the length of *Rs*, the latter relatively long, nearly twice *m–cu*; cell 1*st* M_2 relatively large, rectangular, with *m–cu* at or close to mid-length.

Abdominal tergites chiefly dark brown, the sternites more bicoloured, dark with paler caudal borders; abdomen with conspicuous erect pale setæ; hypopygium yellow. Male hypopygium with the caudal margin of sternal plate only weakly emarginate. Outer dististyle moderately wide, the outer crest of spines extending virtually to base of style, totalling about a dozen spines, the outer longer and more appressed; apical spines short, stout, slightly decurved; surface of style roughened by other smaller scabrous points and spinulæ. Ædeagus of moderate length and stoutness, about the distal third angularly bent and directed laterad, with a conspicuous spinous point at the angle.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, September 18, 1937 (*Macintyre*).

Atarba (*Atarba*) *nodulosa* is allied to *A.* (*A.*) *cincticornis* Alexander, of British Guiana and Ecuador, in the reversed pattern of the antennal flagellum, with the base black instead of yellow. It is readily told from the two hitherto described members of this group by the nodulose antennæ and by details of structure of the male hypopygium.

Trentepohlia (*Neomongoma*) *suberecta*, sp. n.

Thoracic notum black, the pleura and pleurotergite obscure yellow; halteres blackened, the base of stem yellow; legs dark brown, the tarsi a little paler; wings whitish subhyaline, the base and costal portion more yellowish, the outer radial field infumed; stigma conspicuous, dark brown; vein R_3 suberect; petiole of cell R_5 subequal to *m*.

Male.—Length about 8 mm.; wing 7·5 mm.

Rostrum brown; palpi small, black. Antennæ black throughout; flagellar segments oval with relatively short verticils. Head grey; anterior vertex reduced to a tiny line about as wide as the diameter of a single row of ommatidia.

Pronotum black. Mesonotal præscutum chiefly covered by a black dorsal shield, the humeral and lateral portions yellow; scutal lobes black, the median area yellow; scutellum and mediotergite black. Pleura and pleurotergite light yellow, the ventral sternopleurite a trifle infuscated. Halteres with base of stem yellow, remainder blackened. Legs with coxæ and trochanters yellow; femora dark brown, the bases very restrictedly brightened; tibiæ brownish black; tarsi paler brown or yellowish brown. Wings whitish subhyaline, the basal and costal portions a little more yellowish; basal portion of cell *Sc* slightly darkened; wing-tip in outer radial field more infumed; stigma conspicuous, oval, dark brown; veins dark brown, pale in the brightened portions. Venation: R_3 suberect, R_2 oblique; petiole of cell R_5 subequal to *m*; *m–cu* at fork of *M*; cell *Cu* at margin subequal to distal section of Cu_1.

Abdominal tergites dark brown, the lateral borders narrowly pale; lateral portions of intermediate sternites more broadly yellow; hypopygium black.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, September 20, 1937 (*Macintyre*).

Trentepohlia (*Neomongoma*) *suberecta* is entirely distinct from *T.* (*N.*) *disjuncta* (Alexander), the only other species of the subgenus hitherto described.

XXI.—*On the Digital Formulæ of Theriodont Reptiles.*

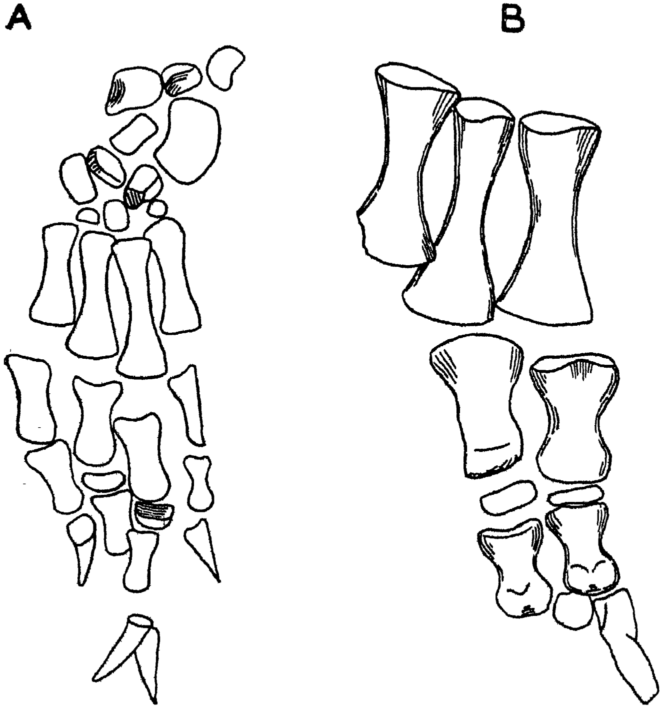
By F. R. PARRINGTON, Cambridge.

IT has been known for a long time that while the Pelycosauria, the earliest and most primitive of the mammal-like reptiles, have the reptilian digital formula of 2, 3, 4, 5, 3, in two other Synapsid Orders, the Dromasauria and the Dicynodontia, the mammalian number 2, 3, 3, 3, 3 has been reached. Recently it had been claimed that the intermediate condition occurs in the Theriodontia.

In two suborders of the Theriodonts, the Therocephalia and the Bauriamorpha, such specimens as are known show that the reduction to the mammalian condition has already taken place. But in another two suborders, the Gorgonopsia and the Cynodontia, reduced phalanges are present in the third and fourth digits. Unfortunately, there is considerable confusion in print as to the actual condition.

In 1930 Broom described both the hand and the foot of a new Gorgonopsid, *Læcænops ornatus*, and in his book, published in 1932, figured the hand and foot of the Cynodont *Thrinaxodon liorhinus* Seeley. In both cases he showed that the reptilian formula had been retained, but that the second phalange of the third

Fig. 1.

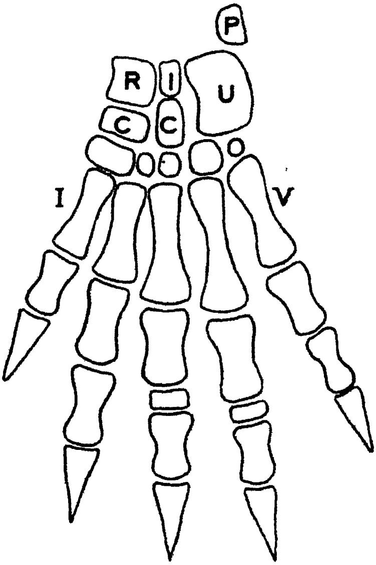


Thrinaxodon liorhinus Seeley.
A, remains of left hand of young specimen. × 2. First finger hidden.
B, part of third, fourth and fifth digits of adult. × 2.

digit and the second and third phalanges of the fourth digit had been greatly reduced in size, a condition obviously suggesting the way in which the reduced condition had been reached in the other orders.

In 1933 the writer described (without figures) the hand of a young specimen of *Thrinaxodon liorhinus*, and pointed out that it differed from Broom's figure in having five distal carpals and in the fourth finger only four phalanges, the second being very small. In 1936 Broom accepted the condition found in this specimen, and remarked that the specimen he had figured was not satisfactory.

Fig. 2.



Thrinaxodon liorhinus Seeley.

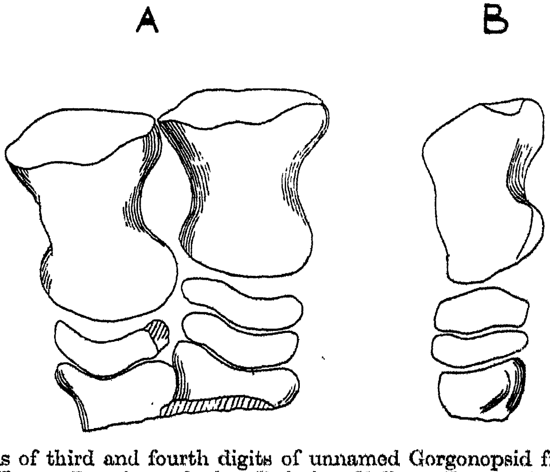
Restoration of hand based on young specimen. × 2.
First finger conjectural.

The recent discovery of part of three digits, which were found with an incomplete skull of an adult *Thrinaxodon*, is important because it confirms the writer's description of the condition found in the fourth finger of the young specimen, and this is the only Cynodont in which a well preserved hand or foot has yet been found. Both specimens are figured, together with a restoration based on the younger specimen (figs. 1, 2).

There is also doubt about the condition in the Gorgonopsia. In 1934 Boonstra described remains of hands and feet in four genera, and in the three cases in which the fourth digit was preserved he found only four phalanges, one being reduced in size, and claimed that the formula for the suborder was 2, 3, 4, 4, 3.

Among the remains of a Gorgonopsid skeleton collected by the writer from the Ruhuhu beds in Tanganyika is a small block containing two incomplete digits. Preparation has shown that in one of these a reduced phalange is present between two of normal size, while in the second two such reduced phalanges are present (fig. 3). It is not possible to say whether these belong to the hand or the foot, but it is quite clear that they must be the third and fourth digits and that for this specimen Broom's formula is perfectly correct.

Fig. 3.



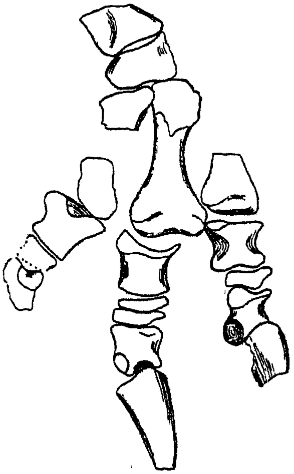
Remains of third and fourth digits of unnamed Gorgonopsid from the Upper Permian of the Ruhuhu Valley, Tanganyika. × 1. A, dorsal view ; B, side view of fourth digit.

In view of the condition found in this specimen the writer examined the hand of the unnamed Gorgonopsid in the British Museum (R. 3768) which was figured by

Boonstra. It was apparent at once that there was matrix covering the middle part of Boonstra's second phalange of the fourth finger, and that only further cleaning would make it possible to give the formula. When the necessary preparation had been done, it became clear that Boonstra's second phalange is in fact two reduced phalanges, pressed close together, and again Broom's formula is correct (fig. 4).

In his discussions of the relationships of the Theriodont suborders, Boonstra (1934, 1938) has put forward the view that the Cynodonts are descended from Therocephalian ancestors. Having the digital formulæ for the Gorgonopsids and the Cynodonts reversed, and believing the latter to be the more primitive, he had a strong argument against the accepted view that the Cynodonts are the Triassic descendents of the Permian Gorgonopsids. But according to the evidence available to the writer, the Gorgonopsids inherited the full reptilian compliment of phalanges in the hand, while in the only Cynodont in which the hand is known this condition

Fig. 4.



Remains of hand of unnamed Gorgonopsid in the British Museum [R. 3768]. × ½.

is modified by loss of one reduced phalange, which is quite in accordance with the original views on their relations.

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XXII.—*Description of* Capromys nana *Allen, a supposedly extinct Cuban Hutia.* By T. C. S. MORRISON-SCOTT. Department of Zoology, British Museum (Natural History).

[Plates V.–VII.]

Capromys nana G. M. Allen, 1917, Proc. New England Zool. Club, vi. p. 54. Type-locality: Sierra de Hato Nuevo, Province of Matanzas, Cuba.

Capromys nana Allen. H. E. Anthony, 1919, Bull. Amer. Mus. Nat. Hist. xli. p. 629. Daiquiri, on coast of Cuba, east of Santiago de Cuba.

Professor Dr. Hans Böker collected a live ♂ and ♀ *Capromys nana* on 30th November, 1937, in the marshy country known as Cienaga de Zapata, south of the town of Jaguey (20° 25′ N., 81° 12′ W.).

These animals live, according to Professor Böker, on the small, dry, bush-covered islands which are dotted about the marshes.

The ♂ and ♀ were apparently a pair. On 1st December, 1937, the ♀ gave birth to a ♂, which died after 14 days. The ♀ died on 11th December, and the ♂, after living for some time in the Berlin Zoo, died on 5th February, 1938. The young ♂ and the ♀ are now in the spirit-collection of the British Museum (B.M. 1938.5.24.1–2 respectively), and the ♂ is made up as a study skin and belongs to the Berlin Museum (B.Z.M. 48721). I am indebted to Professor Dr. H. Pohle for his kindness in lending me the latter specimen.

The original description of *nana* is based on a right lower mandible, no. 9864 of the Mus. Comp. Zool. Harvard, which came from a cave deposit. Anthony, who found fragments of *nana* in a cave at Daiquiri, E. Cuba, mentions (*loc. cit.* p. 630) that the species has been found alive in Central Cuba, but he does not say exactly where nor by whom, and I can find no other published record of the animal being found alive.

Seeing that the species appears to have died out in the east of Cuba and that it is rare elsewhere I propose to give some details of the specimens collected by Professor Böker.

Measurements in Millimetres.

	Type.	♂.	♀.	♂ juv.
Head and body*	..	255	229	208
Tail	..	..	191	107
Hind foot*	..	44	42	29
Ear	..	?	21	15
Total length, skull	..	59·5	53·0	34·0
Condylo-incisive †	..	53·9	50·1	
Zygomatic breadth	..	30·3	29·7	19·6
Palatilar length†	..	26·4	23·8	
Maximum diameter, bulla	..	13·4	12·7	
Width across tympanics	..	22·9	22·4	
Interorbital width	..	14·3	13·1	
Max. length, nasals	..	18·2	16·1	
Max. width, combined nasals	..	7·8	7·6	
Least depth, rostrum	..	11·6	11·0	
Maxillary tooth-row, crowns	..	12·4	10·5	
Maxillary tooth-row, alveoli	..	12·7	10·8	
Max. width M^2	..	3·0	2·9	
Maxillary diastema	..	14·9	14·0	
Mandibular length ‡	35·5	35·6	33·6	
Mandibular tooth-row, crowns	12·2	12·8	11·0	
Mandibular tooth-row, alveoli	12·5	13·1	11·3	
Max. width M_2	..	3·0	2·9	
Mandibular diastema	10·5	8·3	8·3	
Condylo-angular span§	17·0	17·8	17·0	

Skin (described from ♂, B.Z.M. 48721, tail missing).—Dorsal surface speckled buff and very dark brown, the hairs (about 23 mm. in the middle of the back) being slaty brown for about three-quarters of their length, with a buff section near the tip and the tip black; a few of the hairs are entirely black. The fore feet are yellowish grey, with ashy fingers, and the hind feet are yellowish buff with yellowish-ashy toes. A restricted area round the root of the tail (which is absent) is rusty orange. The belly is ashy, with a yellow tinge on the median line. The tail (described from ♀ B.M. 1938.5.24.2) is uniformly covered with stiffish ginger-russet hairs about 11 mm. long.

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* Measured on made-up skin in the case of the adult ♂.

† See Thomas, Proc. Biol. Soc. Washington, xviii. 1905, pp. 191–196.

‡ From back of condyle to anterior end of socket of incisor.

§ From summit of condyle to ventral surface of angular process.

Skull.—See Plates V.–VII.

Measurements.—For measurements of the above specimens in millimetres, see Table on p. 215. The dimensions of bilaterally symmetrical parts are the averages of left and right.

N.B.—The mandibular diastema seems to be the only measurement which does not fit in very well, but the anterior end of the socket of the incisor is not a very determinate point.

EXPLANATION OF THE PLATES.

Plate V.

Capromys nana Allen (B.Z.M. 48721—adult ♂). Dorsal and ventral views of the skull (scale marked in centimetres), and an enlarged view of the maxillary tooth-row (scale marked in millimetres).

Plate VI.

Capromys nana Allen (B.M. 1938.5.24.2—adult ♀). Dorsal and ventral views of the skull (scale marked in centimetres), and an enlarged view of the maxillary tooth-row (scale marked in millimetres).

Plate VII.

Capromys nana Allen (B.M. 1938.5.24.1—juv. ♂). Dorsal and ventral views of the skull (scale marked in centimetres), and an enlarged view of the maxillary tooth-row (scale markod in millimetres).

XXIII.—*Measuring Mammals' Tails*. By T. C. S. Morrison Scott, Department of Zoology, British Museum (Natural History).

The method of mammal-skin measurement at present advocated by the British Museum and many others is that of laying the animal on its belly, bending the tail up at right angles to the body, and measuring from the angle to the tip of the last vertebra to get the tail measurement.

This is all very well, but the "angle" is in fact not an angle but a curve, and the point at which the tail begins is not definite. When the root of the tail is very thick, *e. g.*, in the Binturong, it is impossible even to make an apology for an angle.

A further objection is that unless the tail measurement starts exactly where the head and body measurement ends (and it is not easy to ensure that the point of the dividers or the end of the ruler does not shift), the total length, arrived at by addition, will be incorrect. This particular objection does not of course apply to the American system, where the total length and the tail length are the two measurements used, but to the European system, where the head and body and the tail are the two measurements taken.

I now recommend our collectors to use the anus as the division between the body and tail, and to proceed as follows * :—

(1) Hold the animal by the head and shake it gently so that it acquires its natural length. If *rigor mortis* is present, articulate the neck and spine and stretch out the limbs so as to make the body supple. Pull out the tail (without of course overstretching any ligaments).

(2) Lay the animal out straight on its back on a cork or wooden board, taking care that the hairs of the back are smoothed down, and pull the ears out to each side so that the head rests directly on the board.

(3) Press down gently on the muzzle and allow it to regain its own position †.

(4) Straighten out the tail with the fingers of one hand (or with the help of pins stuck in the board) and stick pin C (see fig. 1) into the board at the extremity of the tail, *i. e.*, the fleshy extremity, not the tips of the hairs.

(5) Stick pin B into the board level with the centre of the anus.

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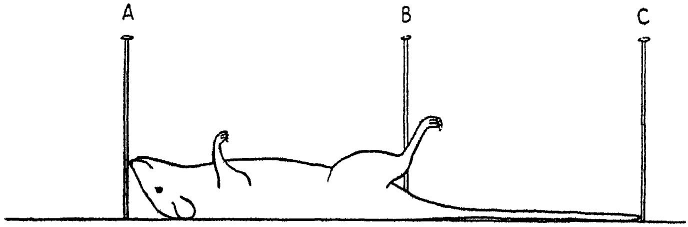
* The method described is modified from that of A. Chappellier, "Les Rongeurs de France," Arch. d'hist. nat. Paris, ix. 1932, pp. 33–37.

† There is no need for the snout to be pressed down against the board while the measurement is being taken; this will not make the animal any longer because the occipital condyles, on which the head hinges, are themselves not in the same plane as the surface of the board but are about on a level with the eye.

(6) Stick pin A into the board so that it touches the tip of the snout.

(7) Remove the animal, place a ruler (or any other straight edge) against pin B and at right-angles to the line A–C. Remove pin B and stick it in again so that it still lies against the ruler but on the line A–C (see fig. 2).

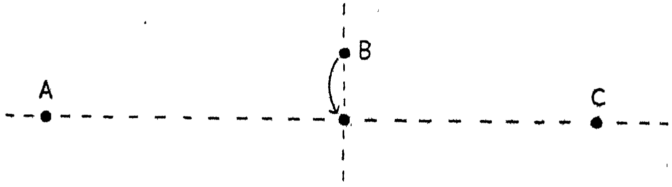
Fig. 1.



Mammal lying on cork or wooden board, with pins stuck in as follows:—A, touching tip of nose, B, level with centre of anus, and C, touching fleshy tip of tail.

(8) The head and body measurement is taken from the inside of pin A to the centre of pin B, and the tail measurement from the centre of pin B to the inside of pin C (see fig. 3). The total length, as used by American systematists, will of course be the distance from the inside of pin A to the inside of pin C.

Fig. 2.



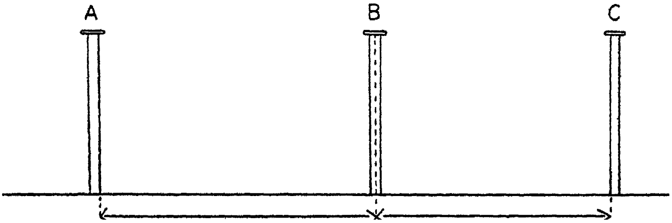
Diagrammatic plan showing how the anus pin B must be moved in so as to be in line with A–C before measurements are taken.

Where the animal's back is rounded, it will be necessary to hold it flat on the board with one hand while sticking in the pins with the other.

By the above method the head and body measurement is in fact the length of the head and the spine, and whether the animal is distended or pregnant, or whether it is very thin, is of no significance. It sounds a complicated method in description, but takes little longer to perform than the old method and does not require such concentration.

Objection will no doubt be raised on the ground that nearly all the recorded measurements have been taken from the root of the bent-up tail, and that the " anus " measurements may not be comparable with them. The reply to this is that I have found (and so have many others) serious divergences between different observers' measurements of the same specimens when measured in the old way, whereas the new way gives much more constant readings, and further, that the " anus " measurements fall within the extremes of the old measurements.

Fig. 3.



The pins are greatly enlarged for clearness' sake.

XXIV.—*Two new Mammals from the Belgian Congo.* By R. W. Hayman, Department of Zoology, British Museum (Natural History).

I am indebted to Dr. H. Schouteden, Director of the Belgian Congo Museum at Tervueren, for the opportunity of describing a new bat and a new rodent from the Belgian Congo. The bat, a *Glauconycteris*, is one of the most striking discoveries of recent years.

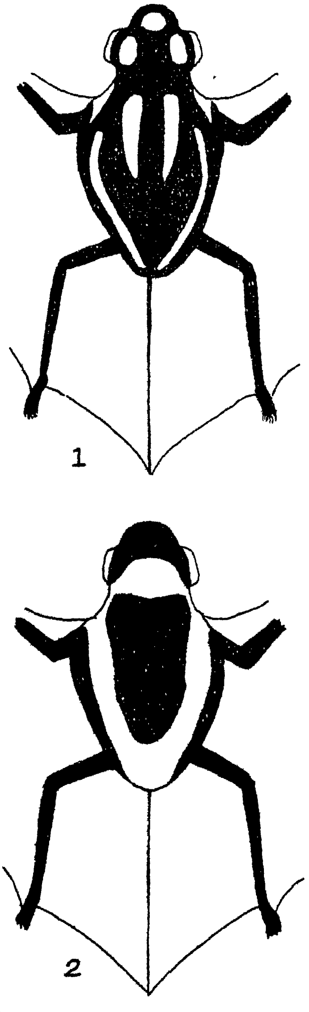
It may be known as

Glauconycteris superba, sp. n.

Diagnosis.—A *Glauconycteris* distinguished from all other members of the genus by its larger size, longer, flattened rostrum, and, above all, by its bold black and white colour-pattern, as figured. (N.B.—The figures are semi-diagrammatic representations of the pattern, and all membranes, including ear-tips, are left uncoloured.)

Type.—In Congo Museum, R.G. no. 14.765. Adult, probably ♂ (the sexual organs were apparently cut away by the collector in opening the body), in alcohol. Collected at Pawa, about 30 miles E.N.E. of Medje, Ituri district, Belgian Congo, by Dr. Dubois of the Congo Red Cross.

Description.—General colour of head and body above and below, limbs, ears, and all membranes, black. The hairs of the body are dark brown basally, and black for the terminal half of their 5–6 mm. length. The body colour is relieved by several pure white patches and bands, the hairs forming which are the same length as the black hairs. These white markings are arranged as follows :—Above (fig. 1), a roughly circular patch, 4–5 mm. in diameter, on the top of the muzzle between the eyes ; a patch on each side of the crown at the base of each ear, about 6 mm. long and a little less wide (these patches appear to encroach on the outer surface of the ear, but do not actually do so, the proximal half of the outer surface of each ear being clothed with short black hairs) ; two lanceolate stripes, one on each side of the median dorsal line on the fore part of the back, each about 18 mm. long, approximately 5 mm. wide anteriorly, and tapering rapidly to their termination about the middle of the back ; two longer, narrower stripes, each about 29 mm. long and 2 mm. wide, one on either side of the body, each commencing a little in advance of, and exterior to, the ends of the scapular stripes last described, and each terminating just short of the root of the tail. On each shoulder, close to the junction of the antebrachial membrane with the body, another stripe begins, about 2 mm. wide, arising exterior to and on a level with the anterior end of the long flank stripe. This shoulder stripe runs forward over the shoulder, and below (fig. 2), joins a wider band, approximately 4 mm. wide, which then turns back and runs without interruption or narrowing along the side of the under-surface of the body, widening to about 6 mm. on the perineal region, where it joins the corresponding stripe of the opposite side of the undersurface. Most of the throat is occupied by a white band, 8 mm. wide at the centre, which narrows laterally to about 3 mm. as it passes on either side of the throat



Glauconycteris superba, sp. n. $\times \frac{2}{3}$.

Fig. 1.—Dorsal aspect.
Fig. 2.—Ventral aspect.

to the posterior outer surface of the lower part of the ear conch. On the side of the neck this band has a narrow connection joining it to the shoulder patch.

Other External Features.—In general form *G. superba* does not differ from other species of the genus. The ears are less rounded and more subquandrangular in outline than in other forms, *G. variegatus papilio* being nearest to it in this respect.

Skull and Teeth.—The skull is proportionately longer and slightly less broad than in any other *Glauconycteris*. A most marked feature is the flattening of the rostrum, so that the profile shows an angle at the junction of the brain-case and the rostrum. The occiput is high, with a minute crest, and the total height of the skull from bulla to occiput is more than half the total length instead of slightly less than half, as in all other species known. The teeth are characteristic of the genus : i^1 is not bicuspid, although there is a minute accessory cusplet on the internal angle near the cingulum. i^2 is closely crowded between i^1 and the canine. The lower incisors are closely crowded, and there is a greater proportionate difference in size between i_1 and i_3 than in other species.

Measurements.—It should be noted that, a a result of the unique type having been preserved originally apparently in formalin, the body has set in such a way that an accurate head and body measurement would probably be nearly 10 mm. more than the figure given here. Head and body 49, tail 39, hind foot 8·3, tibia 21·3, ear 13, tragus 7·5, forearm 47·5. Second digit 44·5 ; third digit, metacarpal 45·5, first phalanx 20·7, second phalanx 24·3 ; fourth digit, metacarpal 44, first phalanx 13·3, second phalanx 10·8 ; fifth digit, metacarpal 40, first phalanx 8·2, second phalanx 8·2. Calcar approximately 11. Skull ; greatest length 16·2, condylobasal length 15·5, palatal length 5·9 to posterior notch, 6·5 to tip of median process, height from bulla to occiput 8·8, interorbital width 5, zygomatic width 11, mastoid breadth 9·5, width of brain-case 8·5, width across canines 6, width across m^3—m^3 7·9, upper toothrow (c–m^3) 6, lower toothrow 6·6, length of mandible 12·2.

Remarks.—Although in certain other species of *Glauconycteris*, namely, *argentata* Dobson, *poensis* Thomas, *alboguttatus* J. A. Allen, and *humeralis* J. A. Allen, all of which are either fawn or brownish in colour, there is a more or less well-defined buff or whitish stripe on the lateral margin of the upper surface of the body, none shows a close approach either to the black and white colour or the pattern of spots and stripes found in *superba*, a pattern suggesting in a modified form that found in the spotted skunk, *Spilogale*. The nearest approach to this pattern is found in another Vespertilionid bat, *Scotomanes ornatus*, from S.E. Asia, a bat of a rich rufous general colour having a single median dorsal stripe and other white markings roughly corresponding in position to those of *Glauconycteris superba*, but much less well defined. The Emballonurine *Saccopteryx bilineata*, from S. America, has a pair of narrow white dorsal stripes on a black ground, but no other white markings, while the North American *Euderma maculata*, another Vespertilionid, is black with three well-defined white patches on the dorsal surface, one on each shoulder and one on the rump. That such a conspicuous new species should be found in a region which has received considerable attention from museum collectors of proved ability such as Lang and Chapin of the American Museum Congo Expedition of 1909–1915, Dr. Christy, and others, is somewhat surprising. It seems that much more collecting needs to be done before we can claim a complete knowledge of the mammalian fauna of tropical Africa.

Mylomys cuninghamei richardi, subsp. n.

Diagnosis.—A large dark form, with black hands and feet, and belly strawy-buff instead of white or whitish.

Type.—R.G. Mus. Congo, no. 14038, adult ♂ skin and skull, original number 32; collected at Leopoldville, Belgian Congo, by Dr. Richard.

Description of Type.—General colour above blackish, grizzled with ochraceous buff. The hairs are black with a short ochraceous ring either including or near the tip. There is no brightening of the tone on the rump as in other *Mylomys*, and there is a pronounced bluish-green iridescent sheen on the dorsal surface. The upper surfaces of hands and feet are black, intermixed with a few straw-coloured hairs, whereas in all other *Mylomys* the hands and feet are pale buff or tawny throughout. The whole of the underside, except for a patch of white on the lower neck, is a clear buff, the hairs being brownish at the base. There is a well-defined demarcation on the flanks. The tail is blackish above, buffy below. (A second, very young, specimen from the same locality, no. 14040, is paler in general hue, the buffy ochraceous hair rings being longer in proportion than in the adult. The underside is buff without any white on the neck, and the hands and feet have a larger proportion of pale hairs than in the adult, but are still darker, especially the toes, than in any other race.) The skull is a little larger than in the type of *alberti* Thomas from the Upper Uelle, and slightly smaller than in *lowei* Hayman from the Gold Coast. As in those two forms, it is large and strongly built, but has no special characters. The teeth show little wear. In the immature specimen the second and third molars are erupting, and the first molars above and below show perfectly the characteristic structure.

Measurements.—No collector's measurements are available, but the skin gives the following approximate figures: head and body 190, tail 163, hind foot 36, ear 20. Skull; greatest length 38·9, condylobasal length 35·9, zygomatic breadth 19·3, nasals 16 long, 5·1 wide, mastoid breadth 14·4, interorbital breadth 5, palatal length 17·3, palatal foramina 8, upper tooth row 8, breadth of m^1 2·7. (N.B.—For the figure 8·7 given erroneously for the latter measurement of *lowei*, Proc. Zool. Soc. Lond. 1935, p. 934, read 2·7.)

Remarks.—The combination of black feet, dark pelage, and buff underparts distinguishes this Middle Congo *Mylomys* at once from all other forms of the genus recently considered by the present author as races of one species (*op. cit. supra*). But although in the colour characters enumerated it is so distinct, the skull is not differentiated from those of the other large *Mylomys*, and it seems best to consider *richardi* as a race living in perhaps more saturate conditions than other forms. Its occurrence at Leopoldville is yet another wide extension of the known range of the genus, which before the discovery of *lowei* in the Gold Coast was known only from Kenya, Uganda, Southern Sudan, and the N.E. Congo.

XXV.—*Some Bees from Palestine* (*Hymenoptera, Apoidea*).

By G. A. Mavromoustakis, Limassol, Cyprus.

The following Palestine bees were collected and kindly sent to me by Mr. J. Glimcher, Jerusalem, Palestine, and the type of the new species is in my collection.

Andrena pyropyga Krich.

Jerusalem, 1 ♀, 18. v. 37, at *Teucrium*; 1 ♂, 25. iv. 37.

Andrena spectabilis Sm.

Jerusalem, 1 ♂, 12. iii. 37.

Andrena vetula Lep.

Jerusalem, 1 ♀, 20. iv. 37.

Halictus mandibularis F. Mor.

Jerusalem, 1 ♀, 15. x. 37, at *Polygonum.*

Halictus carneiventris Dours.

Jerusalem, 1 ♀, 27. vi. 37, at *Thymus.*

Halictus pollinosus Sich.

Jerusalem, 1 ♂, 25. v. 37, at *Ballota.*

Halictus malachurus K.

Jerusalem, 1 ♀, 8. ii. 37, at *Mandragora.*

Halictus marginatus kervilleanus J. Pér.

Jerusalem, 1 ♀, 7. iii. 37, at *Sinapis.*

Halictus holtzi Schulz.

Jerusalem, 1 ♀, 15. x. 37, at *Polygonum.*

Halictus senilis Ev.

Jerusalem, 1 ♂, 25. v. 37, at *Ballota.*

Tetralonia 3-*cincta* Er.

Jerusalem, 1 ♂, 25. v. 37, at *Ballota.*

Tetralonia vestita F. Mor.

Jerusalem, 1 ♂, 25. v. 37, at *Centaurea.*

Eucera sulamita Vachal.

Jerusalem, 1 ♀, 20. iv. 37, at *Centaurea* ; 1 ♀, 6. vi. 37.

Eucera parvula Friese.

Jerusalem, 1 ♀, 25. v. 37, at *Centaurea.*

Eucera pumila J. Pér.

Kiryath Anavin, 1 ♀, 5. iii. 37, at *Bellevalia.*

Anthophora rutilans Dours (=*moderna* F. Mor.).

Jerusalem, 1 ♀, 20. iv. 37, at *Anchusa.*

Anthophora rogenhoferi F. Mor.

Jerusalem, 1 ♀, 29. iv. 37, at *Anchusa.*

Anthophora rubricrus Dours.

Jerusalem, 1 ♂, 27. 1. 37, at *Callendula* ; 1 ♀, 21. iii. 37, at *Bellevalia.*

Xylocopa olivieri Lep.

Jerusalem, 1 ♂, 14. iv. 37, at *Anchusa.*

Ceratina mandibularis Friese.

Jerusalem, 1 ♂, 12. iii. 37, at *Trigonella.*

Eriades fasciatus Friese.

Jerusalem, 1 ♂, 1. vi. 37 ; 1 ♂, 6. vi. 37, at *Ballota.*

Osmia paradoxa Friese.

Gazah, 1 ♂, 25. iii. 37.

Osmia monstrosa J. Pér.

Jerusalem, 1 ♂, 25. iv. 37.

Osmia scutellaris F. Mor.

Jerusalem, 1 ♂, 29. iv. 37, at *Pallenis.*

Osmia compacta J. Pér.

Jerusalem, 1 ♀, 25. v. 37, at *Centaurea.*

Osmia andrenoides Spin.

Gazah, 1 ♀, 25. iii. 35.

Osmia rufotibialis Friese.

Jerusalem, 1 ♀, 24. iii. 37, at *Centaurea* ; 1 ♀, 4. iv. 37, at *Lepidium.*

Osmia cypriaca Mavromoustakis.

Jerusalem, 1 ♀, 1. vi. 37, at *Centaurea.*

Osmia semirubra Friese.

Jerusalem, 1 ♀, 25. v. 37, at *Centaurea.*

Osmia cristata Gerst.

Jerusalem, 1 ♂, 25. iv. 37, at *Centaurea.*

Osmia hemisphærica Alfken.

Jerusalem, 1 ♂, 20. iv. 37.

Osmia onychophora, sp. n.

Male.—Length 8·5 mm. (end of abdomen curled downwards).

Black ; all head below ocelli with dense dull yellowish-grey hairs ; mandibles bidentate, black, subapical area deep reddish brown ; antennæ black ; third antennal joint longer than fourth, fourth shorter than fifth ; last antennal joint curved, but not pointed in the apex (seen from above) ; vertex and occiput with dull yellowish-grey hairs ; scutellum with similar but longer hairs ; area of metathorax shining, shallowly punctured, impunctate and polished in the middle, base minutely and densely punctured ; tegulæ creamy-white, base very narrowly light reddish brown ; wings subhyaline, nervures and stigma brown ; legs black ; apex of femora and tibiæ narrowly light reddish brown ; anterior tarsi light reddish brown ; middle and hind tarsi light reddish brown, basitarsi black ; hind coxæ with short basal curved spine ; spurs pale yellow ; tibiæ with grey hairs above. Abdomen black and moderately shining ; first and second tergites somewhat finely punctured, subapical area finely and densely punctured, apical margin very narrowly polished and shining ; tergites 1 to 5 with the subapical area and the apical margin pale, but the pale bordered by reddish brown above ; sixth tergite with the apical margin produced and nearly rounded, base with short stout spine laterally and between the spine and the apical margin an incision ; seventh tergite short and directed downwards, disk with broad, deep and rounded depression in the middle, apical margin nearly truncate in front and laterally, and resulting in a broad spine laterally beneath ; first tergite with dense greyish-white hairs at sides ; tergites 1 to 5 with apical thin pale greyish-white hair-bands, disk with sparse erect similar hairs, denser at sides ; first and second sternites not modified, rest of sternites not visible.

Gazah, 1 ♂ (type), 20. v. 35.

Megachile apicalis Spin.

Jerusalem, 1 ♀, 23. v. 37, at *Satureya.*

Megachile cinnamomea Alfken.

Jerusalem, 1 ♀, 1. vi. 37, at *Ballota.*

Megachile (*Chalicodoma*) *syraensis* Rad.

Jerusalem, 1 ♀, 25. v. 37, at *Satureya.*

Anthidium tæniatum Latr.

Jerusalem, 2 ♂, 20. vi. 38.

Anthidium anguliventre F. Mor.

Jerusalem, 1 ♀, 1 ♂, 20. vi. 38.

This species was described from Turkomania, and it was recorded from India, Quetta (Dover, in Ann. & Mag. Nat. Hist. (9) xv. p. 252, 1925).

Anthidium ferrugineum ægypticolum Alfken.

Tel-Aviv, 1 ♀, 1 ♂, 10. vi. 38.

Anthidium syriacum J. Pér.

Female.—Length 9 mm.

Black ; clypeus densely and somewhat finely punctured, yellow, apical margin bluntly subcrenulated, sides with a very small black and blunt tubercle ; lateral face-marks reaching level insertion of antennæ, basal half of supraclypeal area, scape in front, a broad entire occipital stripe, all yellow ; antennæ black, flagellum black-brown in front ; clypeus, lateral face-marks, supraclypeal area, apical half of front with short white hairs : vertex and ocicput, basal half of front, with short yellowish-brown hairs (the hairs tinged with deep brown in the apex); cheeks with short white hairs. Mesonotum and scutellum densely punctured, with shorter similar hairs; axillæ, broadly the apical margin of scutellum, a broad L-shaped stripe at sides of mesonotum reaching axillæ, all yellow; second recurrent nervure interstitial with the second transverse cubital nervure; femora light reddish brown, apex of femora and a short stripe on outer side of anterior and middle ones, light yellow; anterior and middle tibiæ light reddish brown beneath and light yellow above; hind tibiæ black beneath, light reddish brown on inner side, and light yellow above (the yellow bordered by black and light reddish brown on inner side); basitarsi densely covered with shining white hairs on outer side, dense and short light golden hairs on inner side; small tarsal joints red-brown; spurs light reddish brown; pulvilli absent. First abdominal tergite with base reddish brown and spotted by black laterally, rest yellow and interrupted by black in the middle (the yellow covering sides except narrowly the basal ones, and bordered by reddish brown beneath), apical margin black; tergites 2 to 4 with similar colour, but the yellow entire except a dark spot in the middle above; fifth tergite yellow, apical margin broadly reddish brown; sixth tergite yellow, apical margin slightly emarginate in the middle; ventral scopa shining white, apex with some deep brown hairs; sternites light reddish brown.

Male.—Length 10 mm. (last tergite bent downwards).

Similar to the *female*; clypeus, basal half of supraclypeal area, scape in front, mandibles except teeth, light lemon-yellow; the broad occipital yellow stripe slightly interrupted. First abdominal tergite coloured as the *female*, but the yellow notched by black on each side of the middle beneath; tergites 2 to 4 black, with broad yellow stripes covering sides, the yellow slightly notched in the middle and on each side of the middle above; fifth and sixth tergites yellow, apical margin except sides, broadly deep reddish brown, the yellow on fifth slightly notched in the middle above; sixth tergite with entire apical margin, base toothed on each side, but between the sharply pointed tooth and the apical margin without incision; seventh tergite as in *Anthidium dalmaticum* Mocs., with the lateral lobes nearly straight laterally above and the apical margin emarginate sublaterally.

Jerusalem, 1 ♀, 20. vi. 38; 1 ♂, 2. vi. 38.

Anthidium syriacum was described by J. Pérez, in Bull. Soc. Am. Sc. Nat. Rouen, pp. 5–6, 1911, from a *male*, and the *female* is new. It is closely related to *Anthidium dalmaticum* Mocs., and it differs in the colour of the pilosity and the integument, and it is probable that *Anthidium syriacum* is only a subspecies of *Anthidium dalmaticum*. I possess 1 ♀ of *Anthidium dalmaticum* from Dalmatia, Ragusa, vii. 1914 (*F. Maidl*), which structurally is not different from *Anthidium syriacum*.

XXVI.—*The Correlation between Colour-pattern and Structure in Insects.* By S. Maulik, M.A., F.Z.S., F.R.E.S., British Museum (Natural History).

[Plates VIII. & IX.]

"The systematist often uses colour-patterns and spots and patches on bodies of insects as characters and guides for the separation of species. The scheme of spots and patches is an expression of the body-material of the organism, which in many cases can be correlated with some structural difference. Several examples are shown to illustrate this principle."

The above was printed in the programmes of Royal Society Soirées held in May and June 1938. The object of this note is to publish the formulation of the principle, to make it available to a larger scientific public and to stimulate research in this direction. The examples that were taken can be seen in the illustration (Pl. VIII.) which is a photograph of the exhibit.

Papilio erithonioides Gr.-Sm. and *Papilio grosesmithi* Rothsch.

In *erithonioides* the submarginal patches on the hindwing are irregularly rounded (two or three of them showing a slight excision of a portion of the outer margin), and the tail at the outer angle of the hindwing is short. In *grosesmithi* the submarginal patches in similar positions on the hindwing are larger, elongated and bifid, although this characteristic feature gradually diminishes as the front margin of the wing is approached, and the tail at the outer angle of the hindwing is long. In these two species of butterflies the characteristic feature of the submarginal patches of the hindwing is correlated with the length of the tail; that is, when the patches are smaller and not deeply forked the tail is short and when the patches are deeply forked the tail is long. Knowing the shape of patches one can say what should be the length of the tail.

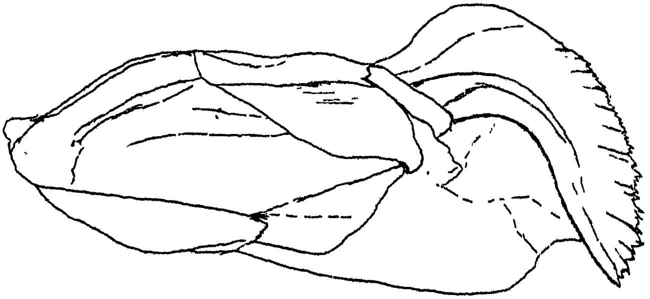
Spindasis syama Horsfield and *Spindasis lohita* Horsfield.

These two species of butterflies are widely distributed, occurring in India, Burma, Malay Archipelago. The structure of the genitalia of *syama* is different from that of *lohita*. Mainly on the basis of this difference one species is considered to be distinct from the other. If the colour-pattern is examined whether on the upperside or on the underside (shown in Pl. VIII.) it will be very difficult to find any obvious difference, so strong is the resemblance. But careful examination of the pattern of the underside will reveal one interesting feature. In *syama* on the basal area of the forewing and parallel to the margin is a plain oblique streak or fascia. In *lohita* this streak is found in a similar position but with a hook-like mark on its inner margin. The presence or absence of this hook of the fascia is correlated with the structure of the genitalia. Once this correlation has been established the dissection, preparation, and examination of the genitalia are unnecessary.

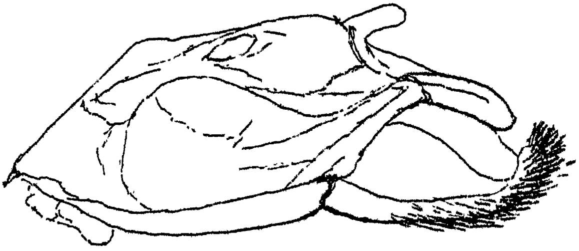
The dry and wet season forms of *Precis antilope* Feisth. are shown. In the dry season form the butterfly is larger, has the lateral margin of the forewing more deeply concave and the inner angle of the lateral margin of the hindwing is produced into a lobe; correlated with these structural features is a certain pattern of the markings on the wings. The wet season form is smaller and has the lateral margin of the forewing less concave and the inner angle of the lateral margin of the hindwing not produced into a lobe; in this case notice the corresponding pattern which is different from that of the dry season form, although the basic elements of the two patterns are very similar. In regard to this example attention should be drawn to the fact that here we are not dealing with genetically different forms.

Utetheisa pulchella Linn. and *Utetheisa lotrix* Cram.

In these two species of moths first of all notice the difference in the structure of the genitalia (only one valve or paramere is shown in each case, see text-fig.), and then the forewing (Pl. IX). Near the outer lateral angle two spots of the terminal series are elongated in *lotrix* and they are not so in *pulchella*; in addition notice that in *lotrix* along the basal margin of the posterior border a short streak is almost non-existent, in *pulchella* it is strongly developed. In Pl. IX. these are marked by arrows and they can be distinctly seen in the actual specimens if the photograph (Pl. VIII.) is examined under a lens.



pulchella



lotrix

One half of the valves or parameres of the genitalia of *Utetheisa pulchella* Linn. and *U. lotrix* Cram.

Heliothis dipsacea Linn. and *Heliothis maritima* Grasl.

Apparently the colour-patterns on the bodies of the two species of moths show no difference and that which exists may be considered as slight variation. But the constancy of the occurrence of a feature gives it value as a systematic character. Such is the case in this example; in *dipsacea* the basal area of the forewing is lighter in colour, in *maritima* the corresponding area has a dark patch (see the photograph, Pl. VIII., under a lens). The genitalia of *dipsacea* are different from those of *maritima*.

Dasysoma catax Linn. and *Dasysoma rimicola* Hübn.

It has been established by dissection and study of the structural features of these two species of moths that they should be regarded as two distinct species but notice how strongly they resemble each other. However, there is one very striking difference; in *catax* the white round spots on the forewing are much brighter than similar spots in similar positions in *rimicola*. In *catax* the spots are *always* brighter, and they are sufficient to distinguish it as a distinct species.

Aulacophora bicolor Weber and *Paridea perplexa* Baly.

The claws of *Aulacophora bicolor* Weber are bifid and those of *Paridea perplexa* Baly are appendiculate (see the photograph, Pl. VIII.). This is the fundamental obvious structural difference between the two species. The arrangement of spots on *bicolor* is so varied that it is possible to find an example which at first sight might be confused with *perplexa*. But on closer examination it will be found that on each elytron of *bicolor* across the basal area on a *straight line* are two spots and across the postmedian are two spots also in a straight line. These spots may be larger in size and fusing with one another may cover larger areas; on the other hand, they may be obsolescent, leaving only a slight trace. Whatever may be the condition the position of the spots relative to one another remains constant, that is to say, the spots will never be found one behind the other and not in a straght line. In *perplexa* across the basal area there are two spots which are so placed that the position of the outer one is slightly behind the inner one, and this is also the case with the spots across the postmedian area. In *perplexa* the relative position of the spots is also maintained; these will never be found on a straight line across. In each species the positional pattern is correlated with the claw-structure. The pattern of *bicolor* will never be found in a specimen with appendiculate claws and *vice versa*. Seen under a lens the photograph, Pl. VIII., will show the difference in the patterns.

Lallemandana interrupta Lall., *Lallemandana sociabilis* Lall., *Lallemandana rapana* Lall., and *Lallemandana tahitiensis* China.

Four species of bugs are dealt with here from the point of view of the thesis of this paper because they show an interesting gradation of a pale yellowish stripe along the back on a background of general black colour from a well-developed condition to one in which the colour has altogether disappeared. Without structural evidence these species may be considered as varieties of one species. In the photograph (Pl. VIII.) is shown under each species two aspects of the genitalia and a glance is sufficient to convince one of their structural difference. In *interrupta* the longitudinal median stripe is broadest and triangular in shape; in *sociabilis* this is narrower and longitudinal in shape, not triangular; in *rapana* and *tahitiensis* it has disappeared; in all cases except *rapana* the scutellum has also pale yellowish colour, so that *rapana* presents a case in which the structures concerned are entirely black, that is, the background colour. The condition of this dorsal stripe (or its presence or absence) is a sufficient indicator for the identification of the species.

The systematist in naming or identifying a specimen is expressing a genetic relationship on evidence other than experimental. If the latter is available then the relationship is completely determined, no other evidence is necessary. But as it is not always possible—in fact, in most cases it is not possible—to have experimental evidence, the systematist has to rely on other evidence which may be obtained from any activity of the living organism. Perhaps it is not necessary to do the breeding experiments in each case. A group of organisms is a group because of the fact that the members constituting it show a resemblance of behaviour, the term being used in a very wide sense which includes structure, form, etc. The systematist studies the organism in its natural surroundings, breeds a few, does some experiments to determine the limits of a species in the group and thus acquires experience of the behaviour of the species of the group the study of which he is taking up. This experience coupled with the acquaintance he has formed with almost all species of the group has built up for the systematist a background on which the whole science of biology is constructed. Whatever ideas the different branches of biological science may accumulate the ultimate object is to discover how the different entities of the biological world are related with one another. All activities of the biological sciences lead but to one goal—that of the systematist.

We know from experience that things that are genetically related resemble each other. Resemblance is the principle. Identification of an object is by recognizing resemblances. The presence or absence of spots and patches are produced by the elaboration of the material of the body, and as the elaboration goes on a definite co-ordination among the different parts of the elaborating matter will be found to exist. Therefore the colour-patterns on the body have a certain relationship with the things we are pleased to differentiate as structures. That we sometimes consider the colour-patterns as mere ornamentations arises from our partiality for the enthusiasm of our æsthetic experiences. To the systematist they show relationship. They may be compared with the chemical indicators which by a characteristic reaction reveal the entire story of a given substance.

The whole aim of science in general is to understand how the apparent recognizable entities of the universe are interrelated, how they merge into one another, how one transforms itself into another, and yet amidst all this constant change a picture, a scheme, a system of the entities, ill-defined though they may be, could be formed. On the understanding of the properties of this system, scheme, picture rests the welfare of human society.

EXPLANATION OF THE PLATES.

PLATE VIII.

A photograph of the exhibit illustrating the thesis of this communication.

PLATE IX.

Forewings of *Utetheisa pulchella* Linn. and *U. lotrix* Cram.

XXVII.—*Distribution of* Œdipoda charpentieri (*Fieber*, 1853) (*Orthoptera*, Acrididæ). By B. P. Uvarov, D.Sc., F.R.E.S.

This species has been described by Fieber ('Lotos,' iii. p. 123) from southern France, Sicily, and Egypt, and Brunner von Wattenwyl recorded it (Prodr. Europ. Orth. p. 166) from Toledo and La Granja in Spain, as well as mentioned a variety from Syria. Saussure ('Prodromus Œdipod.' p. 152) repeated Brunner's information and questioned Fieber's record from Egypt; later (Addit. ad Prodr. Œdipod. pp. 50–51) he has described the Syrian insect as a distinct species, *O. ledereri*. Detailed discussions of specific characters were offered by Pantel (Anales Soc. Esp. Hist. Nat. xv. p. 246; xix. p. 410), who has described it under the name *O. collina* from central Spain. The latest distributional data were given by Chopard ('Faune de France,' Orthoptères, p. 165), who recorded the species from several localities in the Var department of France and from one in the Aude.

The systematic relations of the species were discussed recently by Ramme ('Eos,' iii. 1927, p. 167) on the basis of a re-examination of types. Unfortunately the types, one male and one female in the Brunner collection in Vienna, are without locality-labels, but Ramme has found a male in the Berlin Museum labelled "Sicil. Charp." and probably also belonging to the typical series. On the strength of this he has definitely suggested that these Sicilian specimens should be considered as types of the species, together with a pair in the Halle Museum said to be from Egypt. This suggestion makes Sicily and Egypt as the two typical localities, although the species has not been found in either of the two countries since Fieber's record in 1853. Ramme himself, on his visit to Sicily in 1924, made a point of looking for this species without any result, and extensive collecting in Egypt by many visiting and resident entomologists also failed to produce it.

On the other hand, *O. charpentieri* was repeatedly found in various localities of central and southern Spain and in two areas of southern France. When collecting in spring 1938 in the environs of Algiers I was greatly pleased to find *O. charpentieri* on a small chain of limestone-hills running along the coastal main road between Fort de l'Eau and Birkadem. On the 31st of May the insects were just becoming adult, and I have succeeded in finding only four adults as well as some larvæ. The insects were strongly localized, and found mostly close to outcrops of lichen-covered limestone, which they resembled very closely in the general coloration, belonging in this respect to the f. *sulphurans* of Pantel.

This being the first record of the species for Algeria I became suspicious whether the species has not been merely confused with *O. cærulescens* L. or *O. miniata* Pall. by previous workers on the Algerian fauna. Therefore during my visit to the Paris Museum in September 1938 I looked through the Finot Collection as well as through the general collection of the Museum and various undetermined accessions from North Africa. Amongst hundreds of *Œdipoda* seen by me there were none of *O. charpentieri*, which leads to the conclusion that this species in Algeria must be strongly localized and perhaps does not occur except in the single place where I was fortunate to discover it. Should this be the case the species is definitely threatened there by extinction, since the hills are being gradually planted with pines and fenced off. This makes them inaccessible to sheep, and a good grass-cover appears which makes the habitat quite unsuitable to any *Œdipoda*. At present only a short extent of the hill range remains in the original condition, and if this will be also afforested *O. charpentieri* will cease to exist in that locality. It is not impossible, however, that the species is found in other parts of the coastal limestone-hills, but it must be specially looked for in suitable habitats.

To summarize, the known distribution of *O. charpentieri* is strongly discontinuous, as is shown by the following records :—

Spain : central, eastern, and southern parts, but always localized.

S. France : Frejus, Bagnols, Montauroux, and Hyères in the Var department ; Narbonne in the Aude department.

Sicily : no exact records ; the occurrence wants confirmation.

ALGERIA : Fort de l'Eau, east of Algiers.

EGYPT : no exact records ; the occurrence wants confirmation.

I would like to point out, in conclusion, that the Algerian specimens are all with bright rose wings and have somewhat longer elytra than the Spanish and French ones. It is not impossible that a distinct Algerian subspecies can be recognized, but the material at hand is not sufficiently extensive for a definite conclusion of this kind.

XXVIII.—*The Identity of* Acomys megalotis (*Lichtenstein*), *described from Arabia.* By T. C. S. MORRISON-SCOTT, Department of Zoology, British Museum (Natural History).

Mus dimidiatus Cretzschmar in Rüppell, 1826 (1827), Atlas Reise nördl. Afrika, Pt. I, p. 37. Type-locality Sinai.

Mus hispidus Brants, 1827, Geslacht der Muizen, p. 154.

**Mus megalotis* Lichtenstein, nom. nov., 1827–1834 (1830), Darstellung Säugethiere, pl. xxxvii. fig. 2 and text.

Acomys dimidiatus (Cretz.), Sundevall, 1842 (1843), K. vet. Acad. Handl. p. 222.

I should like to take this opportunity of thanking Professor Dr. H. Pohle for his courtesy in sending me the type of *Mus megalotis* Licht.

There seems to have been some confusion about the identity of *megalotis*. Lichenstein's plate shows *Mus cahirinus* as well as *Mus megalotis*, and the only difference between them is that the latter is shown with larger ears and a longer tail ; the colour † is exactly the same in both figures, *i. e.*, dark grey with a slight brown tinge above and slightly lighter grey below. The text, on the other hand, says : " Die Farbe des Rückens matt gelbgrau, der Seiten isabell, des Unterleibes rein weiss." Brants's description of *hispidus* says practically the same thing : " Geelachtig wit, met een leikleurigen wederschyn op den rug, de onderzyde wit."

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* Hemprich and Ehrenberg collected a single specimen of spiny mouse in Arabia in 1824. Lichtenstein apparently sent the specimen to Brants, who included it in his work as *M. hispidus* Licht., though Lichtenstein had published no description. Three years later Lichtenstein published his description of the same specimen, but finding that *hispidus* was preoccupied by *Echimys hispidus* E. Geoff. he renamed Brants's species *megalotis*.

† I am referring to the copy in the British Museum (Natural History).

Fischer (1928, p. 327) included *hispidus* as a synonym of *dimidiatus*, a fact which made Lichtenstein rather indignant. The latter relied chiefly on the " auffallende Länge " of the ears of *megalotis*, and, secondly, on its elongated snout. It is not clear why Lichtenstein thought that *dimidiatus* had comparatively short ears ; Cretzschmar does not discuss their length at all. As a matter of fact, specimens of *dimidiatus* from Palestine have the ear varying between 18–19½ mm., and one from Tebuk on the Hedjaz railway has an ear of 23 mm. (according to the collector). Lichtenstein gives 9½ lines (20·75 mm.) as the ear length of *megalotis* (though Brants gives 9 lines for the same specimen). As for the elongated snout, the type of *megalotis* does show this (in the skin), but the effect was gained in the preparation. In any case Lichtenstein originally used these characters to differentiate *megalotis* from *cahirinus*, not from *dimidiatus*.

Anderson (1902, p. 284), agreeing with Fischer's view, makes *megalotis* a synonym of *dimidiatus*, but Aharoni (1932, p. 188) synonymises it with *Acomys cahirinus* (Desm.) *, a small form with a dark ash-grey back and a lighter grey belly. This struck me as so curious that I asked Professor Dr. H. Pohle to send me the type † of *megalotis*. The skin is much faded but still shows the bright brown of *dimidiatus*, and the belly, which was originally white, has turned yellowish ; the specimen was clearly never grey on the back or belly. The ears are missing and so is the tail, the latter having been lost by Hemprich and Ehrenberg. The hind foot measures 19 mm. The skull has the occipital and basi-cranial parts missing, but, so far as can be judged from the remainder, it fits in with *dimidiatus* skulls which have an angular border to the brain-case as seen from above, whereas *cahirinus* skulls have a much smoother, more evenly curved outline—more goblet-like.

I have measured eight *dimidiatus* skulls of both sexes from Sinai, Palestine, and Arabia, and thirteen *cahirinus* skulls, all from Egypt. In the following table the averages are shown in brackets: the measurements are in millimetres:—

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* Nouv. Dict. Hist. Nat. xxix. 1819, p. 70. (Aharoni calls this form *Acomys cahirinus cahirinus*.)

† B.Z.M. 1709 : skin and skull.

	Skull over-all *.	M^{1-3} (alveoli).	Width M^1.
8 *dimidiatus* ...	31·1–32·7 (31·9)	4·5–5·0 (4·9)	1·50–1·66 (1·54)
13 *cahirinus*	25·8–30·1 (27·6)	3·9–4·4 (4·2)	1·29–1·45 (1·37)
Type *megalotis* .	estimated over 31	4·5	1·49

A further point arises here. From the above table it appears that *dimidiatus* is quite distinct from *cahirinus*. Flower (1932, pp. 412–415) hints that since *cahirinus* merges via *sabryi* into *witherbyi*, and since he is unable to distinguish *witherbyi* from *dimidiatus*, therefore *dimidiatus* may be a subspecies of *cahirinus*. But the type of *witherbyi*, B.M. 3.2.7.26, ♀, has an over-all length of 28·0 mm., and two others, both topotypes and ♂, B.M. 3.2.7.23 and 3.2.7.25 have this measurement 28·3 and 28·0 respectively. This seems to separate *witherbyi* from *dimidiatus*, though I would like to see more specimens.

Aharoni (1932, p. 188) goes further than Flower and regards *dimidiatus* as definitely a subspecies of *cahirinus* (though I am not clear on what grounds), but on present evidence I do not feel very happy about this decision.

SUMMARY.

Acomys megalotis (Licht.) should be regarded as a synonym of *A. dimidiatus* (Cretz.) and not of *A. cahirinus* (Desm.), as is held by Aharoni (1932). *A. dimidiatus* seems to be specifically distinguishable from *A. cahirinus*. The latter species has a smaller skull than is suggested by Aharoni (1932).

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* Aharoni (1932 p. 186,) says that the over-all length of the skull in both *dimidiatus* and *cahirinus* is over 30 mm.

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XXIX.—*A List of the Type-hosts of the Mallophaga and the Lice described from them* *. By GORDON B. THOMPSON.

[Continued from Ann. & Mag. Nat. Hist. ser. 11, vol. ii. p. 593.]

Superorder NEOGNATHÆ.

Order SPHENISCIFORMES.

Family Spheniscidæ.

53. **Aptenodytes patagonica halli** Mathews.

Nesiotinus demersus Kellogg, 1903. On *Aptenodytes longirostris* from Kerguelen I.

Austrogoniodes brevipes (Giebel), 1876. On *Aptenodytes longirostris* from Kerguelen I.

54. **Aptenodytes forsteri** G. R. Gray. (Emperor Penguin.)

Austrogoniodes mawsoni Harrison, 1937. On *Aptenodytes forsteri*.

55. **Pygoscelis adeliæ** (Hombron & Jacquinot).

Austrogoniodes antarcticus Harrison, 1937. On *Pygoscelis adelie* from Adelie Land.

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* *Note.*—It must be borne in mind when using this list that the type-hosts of the various species of Mallophaga are not fixed but only listed.

56. **Eudyptes sclateri** Buller.

Austrogoniodes strutheus Harrison, 1915. On *Eudyptes sclateri*, probably from Southern New Zealand.

57. **Eudyptes crestatus** (J. F. Miller). (Rockhopper Penguin.)

Austrogoniodes macquariensis Harrison, 1937 (part; see no. 58). On *E. chrysocome* * from Macquarie I.
Austrogoniodes hamiltoni Harrison, 1937. On *E. chrysocome* * from Macquarie I.

58. **Eudyptes schlegeli** Finsch.

Austrogoniodes macquariensis Harrison, 1937 (part; see no. 57). On *E. schlegeli* from Macquarie I.

59. **Eudyptula minor novæhollandiæ** (Stephens).

Austrogoniodes waterstoni (Cummings), 1914. On *Eudyptula minor* from Furneaux Is., off Tasmania.

60. **Spheniscus magellanicus** (J. R. Forster).

Austrogoniodes bifasciatus (Piaget), 1885. On *Spheniscus magellanicus* (*demersus*), Hyslop coll.

Order GAVIIFORMES.

Family **Gaviidæ.**

61. **Gavia stellata** (Pontoppidan). (Red-throated Diver.)

Philopterus colymbinus (Denny), 1842. On *Colymbus septentrionalis* from Britain.
Degeeriella frontata (Nitzsch in Giebel), 1866 (part; see no. 62). On *Eudytes septentrionalis.*

62. **Gavia arctica arctica** (Linn.). (Black-throated Diver.)

Degeeriella frontata (Nitzsch in Giebel), 1866 (part; see no. 61). On *Eudytes arcticus.*

Order COLYMBIFORMES.

Family **Colymbidæ.**

63. **Poliocephalus ruficollis ruficollis** (Pallas). (Little Grebe or Dabchick.)

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* This host is referred to as the Victoria Penguin in the original. The name *Catarrhates pachyrhynchus* is, however, corrected (to *E. chrysocome*) in a note by the editor at the end of the paper.

Degeeriella podicepis (Denny), 1842. On *Podiceps minor* from England.

Degeeriella runcinata (Nitzsch in Giebel), 1866 (part; see no. 66). On *Podiceps minor*, apparently from Germany.

64. **Poliocephalus ruficollis capensis** (Salvadori). (African Little Grebe.)

Degeeriella kilimandjarensis (Kellogg), 1910. Straggler on to skin of *Buteo augur* (=*Buteo rufofuscus augur* Rüppell) from adjacent skin of *Colymbus capensis*, Tanganyika Territory.

65. **Colymbus nigricollis californicus** (Heermann). (American Eared Grebe.)

Pseudomenopon insolens (Kellogg), 1896. On *Colymbus nigricollis californicus* * from California.

Eulæmobothrion simile (Kellogg), 1896. On *Colymbus nigricollis californicus* from Kansas.

Philopterus kansensis (Kellogg), 1896. Same data.

Degeeriella americana (Kellogg & Chapman), 1899. On *Colymbus nigricollis californicus* from California.

66. **Colymbus cristatus cristatus** Linn. (Great Crested Grebe.)

Colpocephalum dolium Rudow, 1869. On *Podiceps cristatus*.

Degeeriella runcinata (Nitzsch in Giebel), 1866 (part; see no. 63). On *Podiceps cristatus*, apparently from Germany.

67. **Colymbus auritus** Linn. (Slavonian Grebe.)

Degeeriella colymbina (Scopoli), 1763. On *Colymbus auritus* from Carniola, Yugoslavia.

Degeeriella fuscomarginata (Denny), 1842. On *Podiceps auritus* from Ireland.

68. **Æchmophorus occidentalis** (Lawrence). (Western Grebe.)

Pseudomenopon par (Kellogg), 1896. On *Aechmophorus occidentalis* from Kansas.

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* Also recorded from *Sterna forsteri* Nuttall (Kansas, Lawrence), but almost certainly a straggler.

Order PROCELLARIIFORMES.

Family **Diomedeidæ.**

69. **Diomedea exulans** Linn. (Wandering Albatross.)

Menopon affine Piaget, 1890. On *Diomedea exulans*, Leyden Mus.

Perineus hyalinus (Neumann), 1911. On *Diomedea exulans* from South Indian Ocean and South of Tasmania.

Perineus lepturus (Enderlein), 1909 (part; see no. 74). On *Diomedea exulans* * from Kerguelen I.

Naubates fuliginosus (Taschenberg), 1882 (part; see no. 73). On *Diomedea exulans*, Meyer coll.

Naubates prioni (Enderlein), 1909 (part; see no. 81). On *Diomedea exulans*, Kerguelen I.

? Harrisoniella diomedeæ (Fabricius), 1775. On *Diomedea* from Brazil.

Episbates angulicollis (Giebel), 1876. On *Diomedea exulans* from Kerguelen I.

Episbates elongatus (Müller), 1927 (*nec Lipeurus elongatus* Packard, 1870), *nom. nov.* for *Lipeurus breviceps* Piaget, 1890, *nec* 1888. On *Diomedea exulans*, Rotterdam Zoo.

Episbates pederiformis (Dufour), 1835. On *Diomedea exulans.*

Esthiopterum nigropunctatum (Enderlein), 1917. On *Diomedea exulans* from between Cape of Good Hope and Tristan da Cunha.

Docophoroides brevis (Dufour), 1835. On *Diomedea exulans.*

Docophoroides dentatus Giebel, 1876. On *Diomedea exulans* from Kerguelen I.

Docophoroides taurus (Giebel), 1861 (unnecessary *nom. nov.* for *brevis* Dufour). On *Diomedea exulans.*

70. **Diomedea albatrus** Pallas. (Short-tailed Albatross.)

Menopon irrumpens Kellogg & Chapman, 1899. On *Diomedea albatrus* from California.

Menopon navigans Kellogg, 1896. Same data. (? Straggler from *Sula* sp.; see Sulidæ.)

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* I have already expressed the opinion that I do not think this species is its true host (Thompson, 1938).

Colpocephalum pingue Kellogg, 1896. Same data.

Neocolpocephalum minor (Uchida), 1926. On *Diomedea albatrus* from Japan.

Perineus concinnus (Kellogg & Chapman), 1899. On *Diomedea albatrus* from California.

Perineus giganticola (Kellogg), 1896. Same data.

Harrisoniella densa (Kellogg), 1896. Same data.

Docophoroides pacificus (Kellogg), 1914 (*nom. nov.* for *taurus* "Nitzsch," Kellogg, 1896, *nec* Giebel, 1861). On *Diomedea albatrus* * from California.

71. **Diomedea nigripes** Audubon. (Black-footed Albatross).

Perineus confidens (Kellogg), 1899. On *Diomedea nigripes* from North Pacific.

Episbates macilhennyi (Kellogg & Kuwana), 1900. On *Diomedea nigripes* from Alaska.

Docophoroides ferrisi Harrison, 1937. On *Diomedea nigripes.*

72. **Diomedea melanophris melanophris** Temminck. (Black-browed Mollymawk.)

Harrisoniella ferox (Giebel), 1867. On *Diomedea melanophrys.*

Esthiopterum ferreirai de Barros Netto, 1933. On *Diomedea melanophrys.*

Docophoroides harrisoni Waterston, 1917. On *Diomedea melanophrys* from South Africa.

Docophoroides murphyi (Kellogg), 1914 (part; ? straggler, see nos. 73 and 76). On *Diomedea melanophrys* from S. Atlantic.

Docophoroides simplex (Waterston), 1914. On *Diomedea melanophrys* † from South Africa.

73. **Diomedea chlororhynchos** Gmelin. (Yellow-billed Mollymawk.)

Naubates fuliginosus (Taschenberg), 1882 (part; see no. 69). On *Diomedea chlororhynchus*, Meyer coll.

Docophoroides murphyi (Kellogg), 1914 (part ‡; see nos. 72 and 76). On *Thalassogeron chlororhynchus* from South Atlantic.

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* Also stragglers from *Fulmarus glacialis rodgersii* Cassin.

† This is almost certainly not the true host. It is probably *Phœbetria p. palpebrata* (Forster).

‡ This is probably the true host of this species.

74. **Phœbetria palpebrata palpebrata** (Forster). (Light-mantled Sooty Albatross.)

Perineus meridionalis (Rudow), 1869. On *Diomedea fuliginosa.*

Perineus tricolor (Piaget), 1880. On *Diomedea fuliginosa,* Leyden Mus.

75. **Diomedea** (*s. l.*), spp. indet.

Perineus miriceps (Kellogg & Kuwana) *, 1902. Described from straggler on *Geospiza fuliginosa* Gould from Galapagos Is., Albemarle I.

Episbates lævis (Rudow), 1870. On *Diomedea* sp., South Seas.

Docophoroides tonsus (Rudow), 1869. On *Diomedea* sp., South Seas.

Family **Procellariidæ.**

Subfamily FULMARINÆ.

76. **Macronectes giganteus** (Gmelin). (Giant Fulmar.)

Philopterus coloratus (Rudow), 1869. On *Procellaria gigantea.*

Philopterus gaini Neumann, 1913. On *Ossifraga gigantea* from Petermann I.

Perineus obscurus (Rudow), 1869. On *Procellaria gigantea.*

Perineus gaini (Neumann), 1913. On *Ossifraga gigantea,* Petermann I.

Perineus melanocnemis (Giebel), 1874. On *Procellaria gigantea.*

Docophoroides murphyi (Kellogg), 1914 (part; almost certainly straggler; see nos. 72 and 73). On *Ossifraga gigantea* from S. Atlantic.

Docophoroides hunteri Harrison, 1937. On *Macronectes gigantea* from Macquarie I. and King George V. Land.

Trabeculus heteracanthus (Waterston), 1912. On *Procellaria gigantea* from S. Africa.

77. **Daption capensis** (Linn.). (Pintado, or Cape Pigeon.)

Ancistrona procellariæ Westwood, 1874. On *Procellaria capensis.*

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* The true host of this species is probably *Diomedea irrorata* Salvin.

Pseudonirmus gurlti (Taschenberg), 1882. On *Procellaria capensis.*

? Pseudonirmus lugubris (Taschenberg), 1882. Straggler on *Sula fiber*, Hamburg Mus.

Perineus mutabilis (Piaget), 1880 (part ; see no. 78). On *Procellaria capensis*, Leyden Mus.

Naubates testaceus (Taschenberg), 1882. On *Procellaria capensis*, Meyer Coll.

78. **Fulmarus glacialis glacialis** (Linn.). (The Fulmar Petrel.)

Menopon brevifimbriatum Piaget, 1880. On *Procellaria glacialis.*

Ancistrona vagelli (Fabricius), 1787. On *Procellaria glacialis.*

Ancistrona gigas (Piaget), 1885. On *Procellaria glacialis*, Barendt's North Polar Expedition.

Perineus mutabilis (Piaget), 1880 (part ; see no. 77). On *Procellaria glacialis*, Leyden Mus.

Perineus nigrolimbatus (Giebel), 1874. On *Procellaria* sp., Arctica (" in höchsten Norden ").

79. **Fulmarus glacialis rodgersii** Cassin. (The Glupisch or Pacific Fulmar.)

Menopon numerosum Kellogg, 1896. On *Fulmarus glacialis* vars. *glupischa* and *rodgersii* from California.

Philopterus occidentalis (Kellogg), 1896. On *Fulmarus glacialis pacificus* and *F. g. rodgersii* from California.

Perineus celer (Kellogg), 1896. On *Fulmarus glacialis* vars. *glupischa* and *rodgersii* from California.

Perineus varius (Kellogg), 1896. Same data.

80. **Halobæna cærulea** (Gmelin). (Blue Petrel.)

Naubates clypeatus (Gmelin), 1874. On *Pachyptila cœrulescens.*

81. **Pachyptila desolata desolata** (Gmelin).

Naubates prioni (Enderlein), 1909 (part ; see no. 69). On *Prion desolatus* from Kerguelen I.

Subfamily Puffininæ.

82. **Priocella antarctica** (Stephens). (Silver-grey Petrel.)

Colpocephalum cinctum Rudow, 1866. On *Procellaria glacialoides.*

Philopterus bicolor Rudow, 1870. Same data.

"Esthiopterum" * caudatum (Rudow), 1869. On *Procellaria glacialoides*, South Seas.

83. **Thalassoica antarctica** (Gmelin). (Antarctic Petrel.)

Pseudonirmus antarcticus Harrison, 1937. On *Thalassœca antarctica.*

84. **Adamastor cinereus** (Gmelin). (Pediunker or Grey Shearwater.)

Menopon longithoracicum Piaget, 1880. On *Procellaria cinerea*, Rotterdam Zoo.

Halipeurus angusticeps (Piaget), 1880. Same host species, Leyden Mus.

85. **Procellaria æquinoctialis æquinoctialis** Linn. (White-chinned Petrel or Cape Hen.)

Giebelia hexakon Waterston, 1914. On *Majaqueus æquinoctialis* from S. Africa.

86. **Puffinus creatopus** Coues. (Pink-footed Shearwater.)

Menopon paululum Kellogg & Chapman, 1899 (part; see nos. 89 and 90). On *Puffinus creatopus* from California.

Naubates (fuliginosus var.) major (Kellogg & Chapman, 1899, *nec* Lipeurus major Piaget, 1880 (part; see no. 90). Same data.

87. **Puffinus gravis** O'Reilly. (Great Shearwater.)

Naubates harrisoni Bedford, 1930. On *Ardenna gravis* from South Africa, Cape Province.

Halipeurus abnormis (Piaget), 1885. On *Puffinus major*, Amsterdam Zoo.

88. **Puffinus puffinus puffinus** (Brünnich). (Manx Shearwater.)

Trabeculus aviator (Evans), 1912. On *Puffinus anglorum*, Scotland.

Trabeculus dimorphus (Waterston), 1912. Same data.

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* It is almost impossible to place this species. It may, however, be a *Pseudonirmus*.

89. **Puffinus griseus** (Gmelin). (Sombre Shearwater.)

Menopon paululum Kellogg & Chapman, 1899 (part; see nos. 86 and 90). On *Puffinus griseus* from California.

Menopon petulans Kellogg & Chapman, 1899. Same data.

Halipeurus petulans (Kellogg & Chapman, 1896. Same data.

Giebelia coronata (Giebel), 1874. On *Puffinus fuliginosus*.

90. **Puffinus opisthomelas** Coues. (Black-vented Manx Shearwater.)

Menopon paululum Kellogg & Chapman, 1899 (part; see nos. 86 and 89). On *Puffinus opisthomelas* from California.

Philopterus validus (Kellogg & Chapman), 1899. Same data.

Naubates (fuliginosus var.) major (Kellogg & Chapman), 1899 (part; see no. 86). Same data.

Halipeurus diversus (Kellogg), 1896. Same data.

Giebelia mirabilis Kellogg, 1896. Same data.

91. **Puffinus lherminieri subalaris** Ridgway. (Brown-backed Little Shearwater.)

Menopon narboroughi Kellogg & Kuwana, 1902 (part; see footnote * and Ardeidæ later). On *Puffinus subalaris* from Galapagos Is.

Philopterus (validus var.) minor (Kellogg & Kuwana)† 1902, *nec* Piaget, 1880. Same data.

Halipeurus (diversus var.) major (Kellogg & Kuwana), 1902. On *Puffinus subalaris*, Galapagos Is., Albemarle I.

92. **Pterodroma macroptera macroptera** (A. Smith). (Grey-faced or Great-winged Petrel.)

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* Also described from specimens taken from *Butorides sundevalli* Reichenow (*Butorides plumbeus*), Galapagos Is., Narborough I. I am inclined to think that *Puffinus lherminieri subalaris* Ridgway is the true host. (See Thompson, 1938.)

† Also described from specimens taken from *Nesomimus parvulus barringtoni* Rothschild (*Nesomimus carringtoni*), Galapagos Is., Barrington I. I take these specimens to be stragglers. Kellogg and Kuwana frequently used the specific name *carringtoni* for Galapagos birds, but this is an obvious typographical error for *barringtoni*.

Naubates pterodromi Bedford, 1930. On *Pterodroma macroptera* from South Africa, Cape Province.

Esthiopterum constrictiventre Pessôa & Guimarães, 1935. On *Aestrelata macroptera* from Brazil.

93. **Pterodroma lessonii lessonii** (Garnot).

Naubates heteroproctus Harrison, 1937. On *Aestrelata lessoni* from Macquarie I.

94. **Pterodroma rostrata rostrata** (Peale). (Thick-billed Petrel.)

Halipeurus marquesanus (Ferris), 1932. On *Pterodroma rostrata* from Marquesas Is.

95. **Pterodroma brevirostris** (Lesson). (Short-billed or Kerguelen Petrel.)

Bedfordiella unica Thompson, 1937. On *Pterodroma brevirostris* from Kerguelen I.

96. **Pterodroma phillipii** (G. R. Gray).

Halipeurus (diversus var.) excavatus Johnston & Harrison, 1912. On *Œstrelata neglecta* from Sunday I.

Halipeurus kermadecense Johnston & Harrison, 1912. On *Œstrelata neglecta* from Kermadec Is.

Giebelia fuscoclypeata Johnston & Harrison, 1912. Same data.

97. **Pterodroma mollis mollis** (Gould). (Soft-plumaged Petrel.)

Colpocephalum furcatum Rudow, 1866. On *Procellaria mollis*.

Trabeculus œstrelatæ (Enderlein), 1917. On *Oestrelata mollis* from sea North-west of Tristan da Cunha.

Trabeculus schillingi Rudow, 1866. On *Procellaria mollis*.

"Esthiopterum" nigricans * (Rudow), 1869. On *Procellaria mollis*, South Seas.

98. **Pagodroma nivea** (Forster). (Small-billed Snowy Petrel.)

Pseudonirmus charcoti (Neumann), 1907. On *Pagodroma nivea*.

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* This may be a *Perineus*. (See Thompson, 1938.)

Philopterus antarcticus Wood, 1937. On *Pagodroma nivea* from Adelie Land.

Family **Hydrobatidæ.**

99. **Oceanites gracilis galapagœnsis** Lowe. (Graceful Storm Petrel.)

Philopterus platycephalus (Kellogg & Kuwana) *, 1902. On *Oceanites gracilis* from Galapagos Is., Albemarle I.

Synnautes exiguus (Kellogg & Kuwana) †, 1902. Same data.

Synnautes languidus (Kellogg & Kuwana) ‡, 1902 (part ; see no. 101). Same data.

100. **Hydrobates pelagicus** (Linn.). (Storm Petrel.)

Philopterus thalassidromæ (Denny), 1842. On *Thalassidroma pelagica* from Britain.

Synnautes pelagicus (Denny), 1842. Same data.

Perineus grandis (Piaget) §, 1880. ? Straggler on *Thalassidroma* (*Procellaria*) *pelagica*, Rotterdam Zoo.

101. **Oceanodroma tethys tethys** (Bonaparte). (The Galapagos White-rumped Storm Petrel.)

Synnautes languidus (Kellogg & Kuwana), 1902 (part ; see no. 99). On *Procellaria tethys* from Galapagos Is., Albemarle I.

Philoceanus becki Kellogg, 1903. On *Procellaria tethys* from Galapagos Is.

102. **Oceanodroma leucorhoa leucorhoa** (Vieillot). (Leach's Fork-tail Petrel.)

Synnautes subangusticeps (Piaget), 1880. On *Thalassidroma leachi*, Rotterdam Zoo.

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* Also described from a straggler on *Geospiza f. fuliginosa* Gould from Galapagos Is., Albemarle I. (See Thompson, 1938.)

† See previous footnote.

‡ Also described from stragglers on *Sula sula websteri* Rothschild, *Actitis macularia* (Linn.), *Pyrocephalus nanus intercedens* Ridway, *Nesomimus p. parvulus* (Gould), *Geospiza f. fuliginosa* Gould and *Cactospiza pallida producta* (Ridgway) from Galapagos Is.

§ The true host of this species seems to be a Skua. See Stercoraridæ later.

103. **Oceanodroma macrodactyla** W. E. Bryant. (Guadeloupe Fork-tail Petrel.)

Colpocephalum dominicanum Kellogg & Mann, 1912. On *Oceanodroma macrodactyla*.

104. **Oceanodroma furcata** (Gmelin). (Fork-tail Petrel.)

Philoceanus annuliventris (Uchida), 1917. On *Oceanodroma furcata* from Japan.

Family **Pelecanoididæ.**

105. **Pelecanoides urinatrix** (Gmelin). (Diving Petrel.)

Pelmatocerandra eatoni Kellogg, 1914 (*nom. nov.* for "Lipeurus" setosus Giebel). On *Pelecanoides urinatrix* from South Georgia I.

106. **Pelecanoides exsul** Salvin [*].

Pelmatocerandra setosa (Giebel), 1876. On *Procellaria urinatrix* from Kerguelen I.

[To be continued.]

XXX.—*The Genus* Lioponera *Mayr* (Formicidæ, Cerapachyinæ), *with Descriptions of Two new Species and an Ergatandromorph.* By Horace Donisthorpe, F.R.E.S., F.Z.S., etc., Department of Entomology, British Museum (Natural History).

Lioponera Mayr, Verk. Zool. Bot. Ges. Wien, xxviii. p. 666 (1878).
Cerapachys Smith, subgen. *Lioponera* Forel in Grandidier, Hist. Nat. Phys. Madagascar, xx. pt. 2, p. 244 (1892).
Lioponera Bingham, Fauna Brit. Ind. ii. p. 26 (1903).
Lioponera Emery, Gen. Insectorum, cxviii. pp. 11–12 (1911).

The genus *Lioponera* [†] was created by Mayr in 1878 for the reception of a species which he described as *L. longitarsus*, sp. n.

He considered it to belong to the Ponerines, placing it between *Lobopelta* Mayr and *Amblyopopone* Erichson. In 1893 [‡] Forel created a tribe Cerapachysii in the

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[*] This is in all probability a subspecies of *urinatrix* Gmelin.

[†] Mayr (*loc. cit.*).

[‡] Forel. Ann. Soc. Ent. Belg. xxxvii. p. 162 (1893).

Ponerinæ for this and some allied genera. In 1895 Emery * placed the genus in the subfamily Dorylinæ. In 1900 Forel † pointed out that it should be considered a Ponerine genus and placed it in a tribe Cerapachii. This tribe was treated as a subfamily—Cerapachyinæ—by Wheeler ‡ in 1902.

In the Gen. Ins. Emery §, in 1911, returned *Lioponera* to the Ponerinæ in a section Prodorylinæ, and a tribe Cerapachyini. In 1920 Wheeler ‖ further elaborated the position of the Cerapachyinæ, firmly establishing them as a subfamily.

CHARACTERS OF THE GENUS.

☿ and ♀. Antennæ 12-jointed, funiculus thickened to a club with the 8th joint distinctly longer than 7th, forming with the following ones a 4-jointed club, last joint not longer than the preceding one. Eyes large. Petiole with a blunt lateral border and pointed anterior angles. ♀ winged.

♂. Structure of head somewhat similar to that of ☿. Antennæ 13-jointed, scape almost reaching the posterior border of the eye, funiculus thickening insensibly towards the apex. Mesonotum without Mayrian furrows. Petiole rounded ; post-petiole strongly constricted behind. Subgenital lamina terminating in two short points. Wings with a large pterostigma, and a variable, and not always distinct, venation.

The ♂♂ in the different species are superficially very like each other, and they do not possess sufficiently salient characters to separate them from those of the genus *Cerapachys* Smith.

Type of the Genus.—*Lioponera longitarsus* Mayr.

Distribution.—India ; Australia ; Africa, north-east and west ; Philippines ; Sumatra.

Habits.—The ☿☿ are subterranean in their habits, and the ♂♂ fly to light. As far as I am aware there are eleven species known up to date. These are :—

1. *Lioponera longitarsus* Mayr [Zool. Bot. Ges. Wien, xxviii. p. 667 (1878)].

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* Emery, Zool. Jahrb. Syst. viii. p. 764 (1895).

† Forel, Journ. Bombay Nat. Hist. Soc. xiii. p. 328 (1900).

‡ Wheeler, Biol. Bull. iii. p. 181 (1902).

§ Emery (*loc. cit.*).

‖ Wheeler, ' Psyche, ' xxvii. pp. 46–55 (1920).

Mayr described this species from 2 ☿☿ and 1 ♀ taken by Rothney at Calcutta.

Long. ☿ 4; ♀ 4; ♂ 3·5 mm.

Emery [Ann. Mus. Stor. Nat. Genoa, xxv p 444 (1887)] described a ♂, which he doubtfully attributed to this species from Sumatra

Long. 3·25 mm.

Forel [Journ. Bombay Nat. Hist. Soc. xiii. p. 329 (1900)] describes the ♀ and ♂ from Calcutta (*Rothney*) and Poona (*Wroughton*).

Bingham [Fauna Brit. Ind. ii. p. 29 (1903)] gives the habitat as Bengal (*Rothney*); Western India, Poona to Travancore (*Wroughton*).

Lioponera longitarsus Mayr var. *australis* For. [Ann. Soc. Ent. Belg. xxxix. p. 422 (1895)].

Forel described a ☿ taken by Turner, Mackay, Queensland, as a var. of *longitarsus.* It is smaller than the typical form, etc. I should think it were much more likely to be a good species.

Long. 3·4 mm.

2. *Lioponera parva* For. [Journ. Bombay Nat. Hist. Soc. xiii. p. 330 (1900)].

Forel described the ☿ and ♂ as a subspecies of *longitarsus* Mayr (now regarded as a good species), and gives the localities: Calcutta (*Rothney*); Orissa (*Taylor*); Burrakpore, Madras (*Rothney*); Dehra Dun (*Smythies*); Poona and Belgaum (*Wroughton*).

Long. ☿, 2·5 mm.; ♂, 2·5–3 mm.

3. *Lioponera noctambula* Sants. [Bull. Soc. Hist. Nat. Afrique Nord, i. p. 70 (1910)].

Santschi describes the ♂ from Kairouan, Tunis. He says the ♂♂ often fly to light on calm nights in the summer months.

Long. 3·2–3·5 mm.

4. *Lioponera decorsei* Sants. Ann. Soc. Ent. Belg. lvi. p. 150 (1912).

Santschi describes a ♂ from Darbunda méridionel, Kébédjé, Mission Charri Tchad. (*Dr. Decorse*) (Muséum de Paris).

Long. 3 mm.

5. *Lioponera nigra* Sants. [Voyage 'Alluaud,' p. 46 (1914)].

Santschi described a ♂ from British East Africa. Molo in the Maü escarpment Dec. 1911. Altitude 2420 metres.

Long. 3·5 mm.

6. *Lioponera luzuriaga* Wheel & Chap. [Phil. Journ. Sci. xxviii. p. 53 (1925)].

Wheeler and Chapman described this species from 16 ☿☿ and 1 ♀ taken at Negros, Oriental Negros Province, Luzuriaga, Horns of Negros, Philippine Islands. Altitude 450 metres (*Chapman*).

Long. ☿ 3·5 mm. ; ♀ 3·5 mm.

7. *Lioponera bicolor* Wheel. & Chap. [Phil. Journ. Sci. xxviii. p. 53 (1925)].

Described from several ☿☿, ♀♀, and ♂♂. Luzon, Laguna Province, Los Baños (*Williams*).

Long. ☿ 2·7 mm., ♀ 3·5 mm., ♂ 3·5 mm.

8. *Lioponera bakeri* Wheel. & Chap. [Phil. Journ. Sci. xxviii. p. 55 (1925)].

Described from 1 ☿ taken by Baker at Basilau.

Long. 4 mm.

9. *Lioponera similis* Sants. [Bull. Ann. Soc. Ent. Belg. lxx. p. 51 (1930)].

Described from 8 ♂♂ taken on the wing. Ivory Coast, Dimbroko (*Le Moult*). Santschi figures the head, antenna, median leg and wing of *L. noctambula* Sants., ♂ ; the head and wing of *L. similis* Sants., ♂ ; the antenna and wing of *L. parva* For. ; and the wing of *L. decorsei* Sants., ♂. He says that some of the African ♂♂ he has described as *Lioponera* sp. may belong to the genus *Cerapachys* Smith, and that it is very desirable to get ♂♂, ♀♀, and ☿☿ from the same nest, when possible.

Long. 2·8–3 mm.

10. *Lioponera cooperi*, sp. n.

♂. Yellowish brown, head, post-petiole, and gaster blackish, the sculpture and pubescence the same as in *longitarsus* Mayr.

Compared with the latter, to which species it appears to come nearest :—*eyes* slightly larger, but not quite so convex; *ocelli* larger, the distance between the median ocellus and the lateral one slightly less; *antennæ* as long and as thick; *scape* slightly longer; joints 3 and 4 of the *funiculus* slightly longer. *Thorax* as robust, and *petiole* and *post-petiole* about the same. *Metatarsus* in intermediate, and posterior leg, equal in length to the *tibia*. *Wings*, venation distinct; *pterostigma* large, light brown, one *discoidal* and one *cubital cell* distinct, *radial cell* open.

Long. 3·5–3·8 mm.

Described from 2 ♂♂. Egypt: Siwa, 30. vi. 35; Marayi, 26. viii. 35 (*J. Omer Cooper*).

Type in Coll. Brit. Mus.

11. *Lioponera alfierii*, sp. n.

♂. Dirty testaceous, head, post-petiole, and gaster darker, middle of scapes, femora, and tibiæ infuscate. Compared with *L. cooperi*:—slightly more slender, puncturation the same, but pubescence considerably less. *Eyes* slightly less convex, *ocelli* smaller, and the distance between the median and the lateral greater; *antennæ* longer and more slender, *scape* slightly longer, joints 3 and 4 of *funiculus* slightly shorter. *Petiole* and *post-petiole* slightly shorter and lower. *Metatarsus* in posterior pairs of legs equal to the *tibiæ* in length.

Wings: *venation* very indistinct; *pterostigma* large, light brown; no cells visible.

Long. 3·2 mm.

Egypt: Wada Digla, 23. viii. 25. Coll. Alfieri, 1 ♂.

Type in Brit. Mus. Coll.

These two species differ from *L. noctambula* Sants. in the length of joints 3 and 4 of funiculus, the post-petiole and the metatarsus, etc., and from *L. decorsei* Sants. in colour, structure, size, etc.

ERGATANDROMORPH.

Dirty testaceous, head, post-petiole, and gaster darker.

Head slightly more rounded than in typical ☿, *eyes* more convex, *ocelli* small, but distinct; *antennæ* 13-jointed, but not as long as in usual ♂, joints 3 and 4 of *funiculus* as broad as long, 8th joint longer than 7th; left anntenna slightly shorter than right, as is also the scape;

the last joint is slightly curved inwards. *Thorax*, *petiole*, *post-petiole*, and *gaster* ☿.

♂. Genitalia present.

Long. 2·9 mm.

Egypt : Ghizeh, Dec. 1901, in rough grass (*F. Morey*).

It is difficult to say to which species this Ergatandromorph belongs. It brings the total of described gynandromorphous ants up to 64.

The F. Morey in question is the Frank Morey of Newport, Isle of Wight, who edited the well-known 'A Guide to the Natural History of the Isle of Wight' (1909).

XXXI.—*Neue* Lycus *spp. aus Ost-Afrika.*

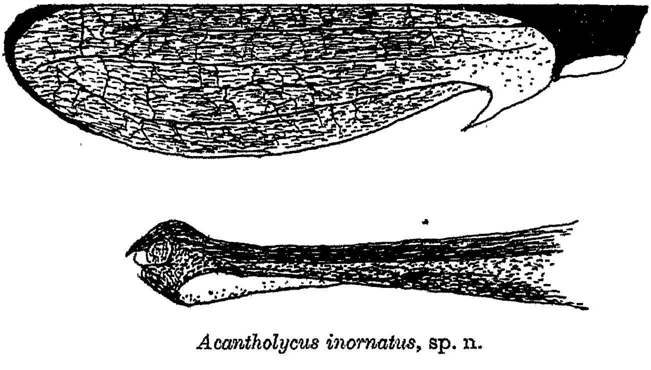
Von R. Kleine, Stettin.

Im *Lycus*-material des Britischen Museums, London, fand ich eine Anzahl neuer Arten. Die Typen sind im Britischen Museum aufbewahrt.

1. *Acantholycus inornatus*, sp. n. (Abb. 1, 2.)

Schwarz, Prothorax an den Seiten sehr schmal gelb, Elytren lehmgelb, an der Basis in geringem Umfange schwarz, der Hinterrand schmal, dunkel gerandet. Stirn von Auge zu Auge breit, flach eingedrückt, Fühlerbeulen schwach entwickelt; Rüssel etwa doppelt so lang wie an der Basis breit. 3. Fühlerglied so lang wie das 4. und 5. zusammen, 4.–10. gezähnt, nach vorn an Länge, nicht

Abb. 1.



Acantholycus inornatus, sp. n.

an Breite abnehmend, 11. länger als das 10.—Prothorax breiter als lang, Vorderrand geschwungen, abfallend, Vorderecken stumpf, Seiten hinter der Mitte ganz schwach nach aussen vorgewölbt, Hinterecken stumpf, Seitenränder aufgebogen, Skulptur flach, grob. Schildchen lang, zungenförmig, Hinterrand gerade. Elytren mit kräftigem Schulterdorn, Erweiterung nur gering, 1. und 2. Rippe deutlich, die Sekundärrippen und die übrige Skulptur durch kurze Behaarung verdeckt und unscharf. Penis Abb. 2.

Länge : 16 mm. Breite (hum.) : 4 mm., total 7 mm.

Kenya Kolonie : West Aberdares (above 9000′), März–April 1934 (*H. J. Turner*).

1 ♂.

Die Art kann nur zu *Acantholycus* gehören. Nicht nur die kräftigen Schulterdorne weisen ihr diese Stellung zu, auch die Form des Penis spricht dafür. Etwas abweichend ist der ganze Habitus. Die den *Acantholycus*-Arten eigene starke Erweiterung der Elytren fehlt. Es sind allerdings schon andere, ähnlich gebaute Arten bekannt. Diese Arten sind, auf Grund des charakteristischen Schulterdornes, zu *Acantholycus* gestellt worden. Eine scharfe Trennung der einzelnen Untergattungen ist eben nicht möglich.

Abb. 3.

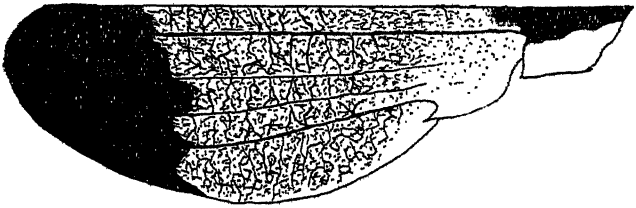
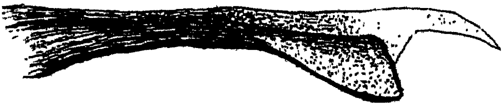


Abb. 4.



Acantholycus vividus, sp. n.

2. *Acantholycus vividus*, sp. n. (Abb. 3, 4.)

Abdomen schwarz mit breiten, gelben Rändern, nur das letzte Segment ganz schwarz, Ausfärbung der Körperoberseite Abbildung 3.—Rüssel circa dreimal so lang wie an der Basis breit.—3. Fühlerglied so lang wie das 4. und 5. zusammen, 4.–10. gezähnt, nach vorn an Länge und Breite abnehmend.—Prothorax siehe Abbildung, Skulptur sehr schwach.—Schildchen zungenförmig, Hinterrand gerade.—Die neben der Saturalrippe liegende (zweite) Rippe sehr kräftig und erhöht, die 5. tiefliegend.—Penis Abbildung 4.

Länge: 16 mm. Breite (hum.) : 4·5 mm., total 11 mm.

Kenya Kolonie: Nairobi, x. 1929 (*Dr. G. A. K. Marshall*). 2 ♂♂.

Es besteht eine ziemliche Aehnlichkeit mit *carpenteri* Pic. Die Penisform ist in beiden Arten aber derartig verschieden, dass keine Verwechslung möglich ist.

Abb. 5.

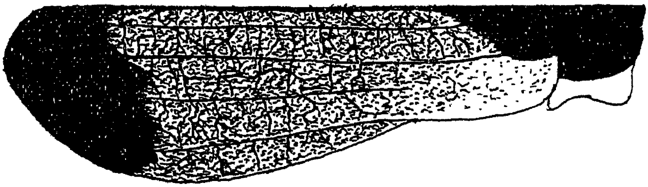
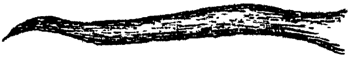


Abb. 6.



Lopholycus laticollis, sp. n.

3. *Lopholycus laticollis*, sp. n. (Abb. 5, 6.)

Habituell und in der Ausfärbung mit *rotundicollis*, sp. n. übereinstimmend. Auch der Penis ist, wenn auch nicht von genau derselben Gestalt, so doch sehr ähnlich. Die Unterschiede sind folgende: Die Fühler sind schlanker, die einzelnen Glieder daher auch länger als bei *rotundicollis*. Der Prothorax ist stark quer, etwa doppelt so breit wie in der Mitte hoch, nach allen Seiten stark aufgebogen. Auf den Elytren ist die Skulptur grob und tief und verdeckt die Querrippen fast ganz. Die Anlage der schwarzen Spitzenpartie ist eine andere.

Länge: 10 mm. Breite (hum.): 3 mm., total 7 mm.

Kenya Kolonie: Nairobi, v. 21 (*A. F. J. Gedye*). 1 ♀.

4. *Lopholycus rotundicollis*, sp. n. (Abb. 7, 8.)

Tiefschwarz, die hellen Partieen auf Prothorax und Elytren dunkellehmgelb. Stirn steil abfallend, über den Fühlerbeulen tief grubig eingedrückt; Rüssel wenigstens doppelt so lang wie an der Wurzel breit. Fühler gedrungen, das 3. Glied länger als das 4. und 5. zusammen, 4.–10. in beiden Geschlechtern schwach gezähnt, 11. länger als das 10. Prothorax am Hinterrand breiter als in der Mitte hoch, Vorderrand gerundet, Seiten geschwungen, Hinterecken stumpflich, Seiten stark aufgebogen, Randskuptur sehr kräftig. Schildchen lippenförmig. Elytren hinter der Mitte etwas erweitert, Rippen und Skulptur kräftig. Penis Abbildung 8.

Abb. 7.

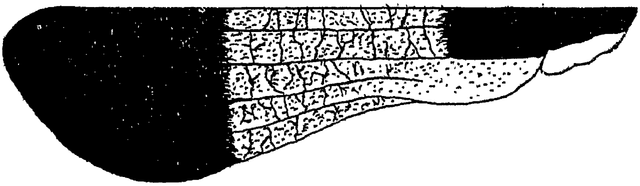
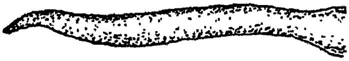


Abb. 8.



Lopholycus rotundicollis, sp. n.

Länge: 10 mm. Breite (hum.): 3 mm., total 4 (♂) 7 (♀) mm.

Kenya Kolonie: Naiwasha, März–Mai, 1936 (*H. J. A. Turner*): Mfungano I., Victoria, Nyanza; desgl. Lusinga I. (*S. A. Neave*); Uganda: Busamba Forest, Semlicki Valley, 2300–2800′ (*S. A. Neave*); Budongo Forest, Unyoro, 3400′ (*S. A. Neave*); Mabira Forest, Chagwe, 3500–3800′ (*S. A. Neave*).

12 ♂♂, 4 ♀♀.

Die Variation ist sehr bedeutend, sowohl was Prothorax Habitu sund Ausfärbung anlangt. Penisautopsie kann erforderlich werden.

5. *Lopholycus atromarginatus*, sp. n. (Abb. 9, 10.)

Schwarz, Prothorax und Elytren lehmgelb mit schwarzer Zeichnung (Abbildung 9). Stirn über den nur schwach entwickelten Fühlerbeulen stark grubig vertieft; Rüssel etwa doppel so lang wie an der Basis breit. 3. Fühlerglied so lang wie das 4. und 5. zusammen, 4.–9. schwach gezähnt, 10. stumpf, 11. länger als das 10. Prothorax nicht einheitlich in der Gestalt, am Hinterrand breiter als in der Mitte hoch, Vorderecken stumpf aber deutlich oder ganz obsolet, Seiten geschwungen, Hinterecken stumpf oder spitz vorgezogen, mit grosser, flacher Punktierung. Elytren flach aber grob skulptiert. Penis Abbildung 10.

Abb. 9.

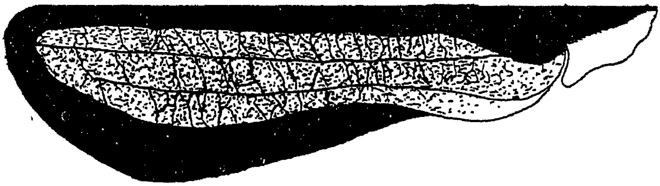
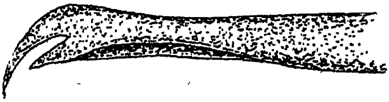


Abb. 10.



Lopholycus atromarginatus, sp. n.

Länge: 11–13 mm. Breite (hum.): 4 mm. (total): 7 mm.

Uganda: Mt. Kokanjero, S.W. of Elgon, 6400′ (*S. A. Neave*).

2 ♂♂, 1 ♀.

Die Ausfärbung kann schwächer sein wie auf der Abbildung wiedergegeben, sie geht aber nicht soweit zurück, dass die Artzugehörigkeit zweifelhaft sein könnte. Eine entfernte Aehnlichkeit hat *L. longipes* Pic.

6. *Lopholycus turneri*, sp. n. (Abb. 11, 12.)

Tiefschwarz, glänzend, Prothorax an den Seiten schmal lehmgelb, die schwarze Partie den Vorder- und Hinterrand erreichend, Elytren lehmgelb, die Basis breit schwarz, nach hinten verschmälert sich die schwarze Partie und bleibt als schmaler Streifen an der Sutura, Hinterrand schmal, scharf abgesetzt, schwarz. Scheitel tief, gross, grubig eingedrückt; Rüssel etwa viermal so lang wie der Kopf. 3. Fühlerglied etwa so lang wie das 4.–6. zusammen, 4.–10. an Länge abnehmend, nur ganz schwach gezähnt, 11. kaum länger als das 10. Prothorax am Hinterrand breiter als in der Mitte hoch, dachförmig abfallend, keine deutlichen Vorderecken, Hinterecken gerundet, Mittelfurche schmal und flach, Seiten stark aufgebogen. Schildchen klein, zungenförmig, Hinterrand gerade, Elytren nach hinten etwas erweitert, Rippen auffallend stark, Skulptur aus wenigen Querrippen bestehend, Punktierung flach. Penis Abbildung 12.

Abb. 11.

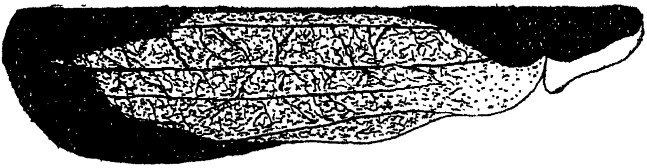
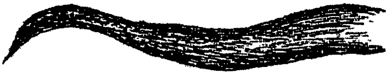


Abb. 12.



Lopholycus turneri, sp. n.

Länge: 10 mm. Breite (hum.): 2·5 mm.

Kenya Kolonie: Naivasha (*H. J. Turner*); Nandi Escarpment (forest), 5800′ (*S. A. Neave*); Kampala (*A. F. Gedye*); Ngong, März 1936 (*H. J. A. Tunrer*).

6 ♂♂, 16 ♀♀.

Eine zarte, kleine Art. Die Variation ist sehr gross, sowohl in der Ausfärbung wie auch im Habitus. Nur die Form des Prothorax ist recht konstant. Das Habitusbild, Abbildung 9, gibt ungefährt die mittlere Stärke der Ausfärbung wieder.

7. *Lopholycus dominus*, sp. n. (Abb. 13, 14.)

Schwarz, Prothorax und Elytren strohgelb mit schwarzer Zeichnung Abbildung 13. Stirn über den Fühlerbeulen tief grubig eingedrückt, Fühlerbeulen flach, undeutlich gefurcht, Rüssel etwas dreimal so lang wie an der Basis breit. Fühler schlank, 3. Glied nicht ganz so lang wie das 4. und 5. zusammen, vom 4.–10. kaum an Länge, an Breite garnicht abnehmend, 5.–10. gezähnt, 11. etwas länger als das 10. Prothorax deutlich breiter als in der Mitte hoch, Vorderrand bis zu den Hinterecken rundlich-dachförmig abfallend, diese gerundet, Vorderkiel sehr kurz, Furche kaum angedeutet, Seitenränder erhaben, auf der ganzen Fläche kräftig punktiert, keine Behaarung. Schildchen zungenförmig, Hinterrand gerundet. Elytren mit stark entwickelten Schultern, nach hinten etwas erweitert, Rippen und Quergitterung deutlich, aber wie die Skulptur durch Behaarung stark verdeckt. Penis Abbildung 14.

Abb. 13.

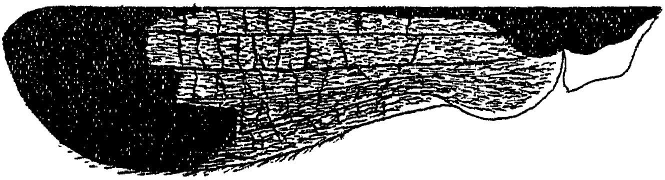
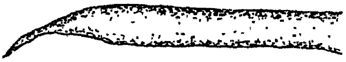


Abb. 14.



Lopholycus dominus, sp. n.

Länge: 11–13 mm. Breite (hum.): 4 mm. (total): 7 mm.

N.W. Rhodesia: Kashitu, N. of Broken Hill, i. 1916 (*H. C. Dollman*).

2 ♂♂, 1 ♀.

Von ähnlichen Arten durch den schlanken Habitus, die Ausfärbung und den einfachen Penis leicht und sicher zu trennen.

8. *Lopholycus pusillus*, sp. n. (Abb. 15, 16.)

Schwarz, Elytren und Prothorax lehmgelb mit schwarzer Zeichnung (Abbildung 15). Stirn breit und flach vertieft, Fühlerbeulen sehr schwach, Rüssel etwa dreimal so lang wie an der Basis breit. Prothorax dreieckig, Vorderrand in der Mitte spitz vorgezogen, Seiten wellig, Vorderecken stumpf, Hinterecken rund, Vorderrandskiel kurz, schmal, Furche im Hinterrandsteil flach, unscharf, Seitenränder schräg erhaben, Skulptur undeutlich. Schildchen kurz, zungenförmig, Hinterrand nicht eingebuchtet. Elytren mit stark erweiterten Schultern; Rippen, Gitterung und Skulptur kräftig, Seitenrand dicht behaart. Penis Abbildung 16.

Abb. 15.

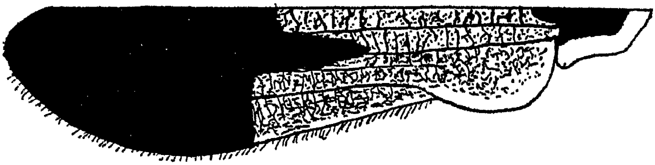
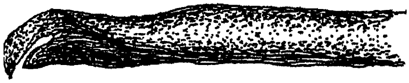


Abb. 16.



Lopholycus pusillus, sp n.

Länge: 9–10 mm. Breite (hum.): 3 mm. (total): 4–4·5 mm.

Mashonaland: Chirinda (*G. K. A. Marshall*); Chibaba: Lower Buzi R. (*C. F. M. Swynnerton*).

2 ♂♂, 2 ♀♀.

Die Variationsbreite dürfte gering sein. Es ist die kleinste Art die ich gesehen habe.

9. *Lopholycus maderi*, sp. n. (Abb. 17, 18.)

Abdomen rotgelb, nach der Mitte zu verdunkelt, Brust braun, Kopf, Fühler und Schildchen schwarz, Prothorax und Elytren irdenfarbig, die schwarze Zeichnung Abbildung 17. Stirn über den breiten, flachen Fühlerbeulen nur wenig eingedrückt, Rüssel breit, nur 1½ mal so lang wie an der Basis breit. Fühler kurz aber robust, 1. Glied stark, 2. sehr kurz, napfförmig, 3. dreieckig, etwas länger als breit, 4.–10. gezähnt, gleichlang aber nach vorn an Breite abnehmend, 11. beträchtlich länger als das 10. Prothorax am Hinterrand breiter als in der Mitte hoch, Vorderrand wellig abfallend, Hinterecken gerade, Vorderecken rund, Seitenränder flach aufgebogen, Randpunktierung vorhanden aber wenig kräftig, Vorderkiel kurz und breit, Furche fehlt. Schildchen zungenförmig. Elytren mit starken Rippen, kräftiger Gitterung und grober Skulptur. Penis Abbildung 18.

Länge : 16 mm. Breite (hum.) : 4 mm. (total) : 7 mm.
Nord-Nigeria : Minna (*J. J. Simpson*), 19. x. 1910.
1 ♂.

Durch die dunkle Ausfärbung die an *Lycus kolbei* erinnert sofort erkennbar. Durch den charakteristischen Penis leicht und sicher festzulegen.

Abb. 17.

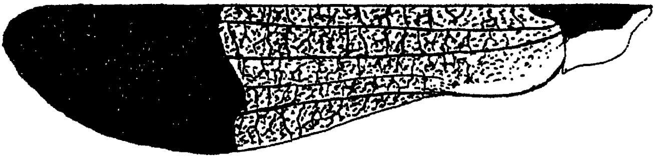
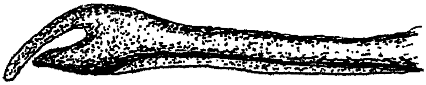
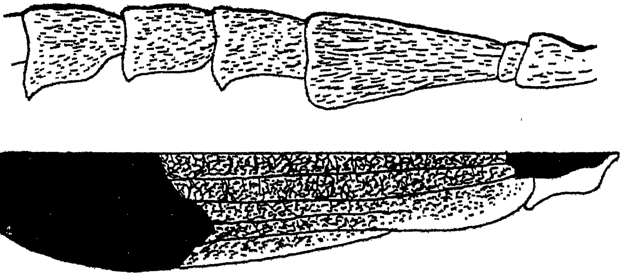


Abb. 18.



Lopholycus maderi, sp. n.

Abb. 19.



Habitusbild und 1.–6. Fühlerglied von
***Lopholycus cinctiventris* Pic.**

10. *Haplolycus acutipennis*, sp. n. (Abb. 20, 21.)

Abdomen schwarz, die letzten drei Segmente heller, Brust, Kopf und Fühler dunkler oder heller braun, Beine in der Farbe des Abdomens oder heller, Prothorax, Schildchen und Elytren lehmgelb, die Dunkelfärbung ist nur auf den Elytren deutlicher und wird graubraun aber nicht schwarz. Kopf über den schwach entwickelten Fühlerbeulen mit zwei flachen Eindrücken; Rüssel kräftig, etwa doppelt so lang wie an der Basis breit. 3. Fühlerglied länger als das 4. und 5. zusammen, 4.–10. gedrungen, kaum eingekerbt, nicht gezähnt, 11. wenig länger als das 10. Prothorax quer, am Hinterrand breiter als in der Mitte hoch, Vorder- und Hinterecken gerundet, Seiten nur ganz schwach aufgebogen aber kräftig punktiert. Schildchen robust, wenig länger als breit, am Hinterrand etwas eingebogen. Elytren schlank, fast parallel, Rippen und Skulptur flach, Hinterecken spitz ausgezogen. Penis Abbildung 21.

Abb. 20.

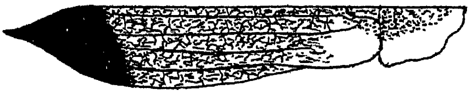
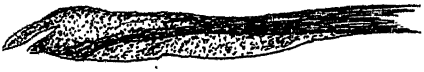


Abb. 21.



Haplolycus acutipennis, sp. n.

Länge: 9·5–13 mm. Breite (hum.): 2·5–3·0 mm., total 4·0 mm.

Uganda: between Jinga and Busia or Mbwago's, E. Busoga (some forest), 3800–4000′, Juli–Aug. 1911 (*A. S. Neave*); North of L. Isolt ,3700′, Jan. 1912 (*S. A. Neave*); shores of L. Isolt or Wamala, 3800′, Jan. 1912 (*S. A. Neave*).

1 ♂, 2 ♀♀.

Durch die Gestalt der Elytren und die ganz auffallende helle Allgemeinfärbung von allen mir bekannten Arten leicht und sicher zu unterscheiden.

11. *Haplolycus minimus*, sp. n. (Abb. 22–26.)

Abdomen schwarz, mit Ausnahme des letzten sind alle Segmente an den Seiten lehmgelb, Brust, Beine, Kopf und Fühler schwarz, Prothorax lehmgelb mit breiter, schwarzer Mittelbinde, Elytren lehmgelb, in wechselnder Ausdehnung schwarz. Abbildung 22–24. Stirn von Auge zu Auge halbkreisförmig vertieft, Fühlerbeulen breit, mässig stark. Fühler in beiden Geschlechtern kurz, 3. Glied wenig länger als das 4, schwach gezähnt, nach vorn an Breite, weniger an Länge abnehmend, 11. länger als das 10. Prothorax quer, Vorderecken stumpf gerundet, Seiten hinter der Mitte nach innen gebuchtet, Hinterecken mehr oder weniger, zuweilen flügelartig vorgezogen, die

Abb. 22.

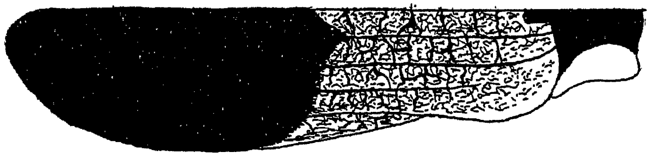


Abb. 23.

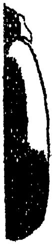


Abb. 24.

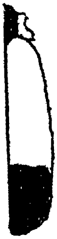


Abb. 25.

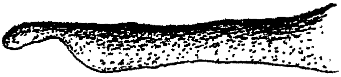
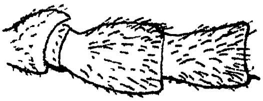


Abb. 26.



Haplolycus minimus, sp. n.

Ränder nur schwach aufgewölbt, Skulptur flach. Schildchen zungenförmig. Elytren mit sehr flacher, zuweilen undeutlicher Skulptur und gleichen Querrippen. Penis Abbildung 25.

Länge : 7–11 mm. Breite (hum.) : 1·5–2 mm.

Kenya Kolonie : Kaimos (März-April 1932, *H. J. A. Turner*) ; Osiri, N. Kavirondo (Juni 1934, *H. J. A. Turner*) ; Muhoroni (März 1936, *H. J. A. Turner*).

6 ♂♂, 3 ♀♀.

Eine kleine, gedrungene Art die durch den breiten Prothorax, den Penis, das kurze 3. Fühlerglied sehr leicht erkennbar ist.

12. *Haplolycus neavei*, sp. n. (Abb. 27, 28.)

Schwarz, Prothorax und Elytren lehmgelb mit schwarzer Zeichnung, Abbildung 27. Stirn über den flachen Fühlerbeulen nur wenig eingedrückt; Rüssel doppelt so lang wie an der Basis breit. 3. Fühlerglied so lang wie das 4. und 5. zusammen, 4.–10. schwach gezähnt, 11. länger als das 10. Prothorax quadratisch oder schmäler als hoch, kantig, alle Ecken spitz, Seiten stark aufgebogen, Skulptur schwach. Schildchen zungenförmig. Elytren mit deutlichen Rippen aber schwacher Skulptur, die durch dichte Behaarung verdeckt wird. Penis Abbildung 28.

Abb. 27.

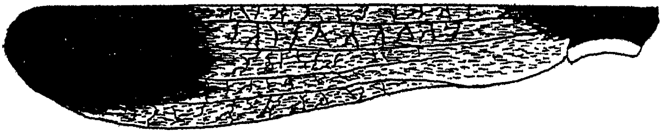
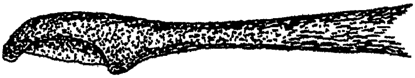


Abb. 28.



Haplolycus neavei, sp. n.

Länge: 11–13 mm. Breite (hum.): 3 mm., total 5 mm.

Uganda: W. shores of Victoria Nyanza, Buddu, 3700′ (*S. A. Neave*).

1 ♂.

Die Art sieht *subsuturalis* Pic sehr ähnlich, ist aber im männlichen Geschlecht durch den gänzlich anders gebauten Penis sofort erkennbar. Ausserlich sind die Arten dadurch zu trennen, dass bei *neavei* der Prothorax schmal, kantig und quer ist, ferner dass die Elytren stark behaart sind. Bei *subsuturalis* ist der Prothorax mehr dreieckig, auf jeden Fall nach hinten verbreitert und die Elytrenbehaarung fehlt. Rippen und Skulptur treten dadurch schärfer hervor.

13. *Haplolycus paradoxus*, sp. n. (Abb. 29, 30.)

Abdomen schwarz mit hellen Rändern bis zum vorletzten Segment, Brust, Beine, Kopf, Fühler und Schildchen schwarz, Prothorax und Elytren lehmgelb, die schwarzen Partieen Abbildung 29. Kopf mit sehr tiefer, von Auge zu Auge reichender Grube, die über den flachen, breiten Fühlerbeulen dreieckig eingebuchtet ist; Rüssel doppelt so lang wie an der Basis breit. Prothorax am Hinterrand breiter als in der Mitte hoch, Vorderrand abfallend, Vorderecken ganz obsolet, Hinterecken stumpf-spitzig vorgezogen, Seitenränder aufgebogen, grob skulptiert. Fühler schlank (Abb. 30), 3. Glied so lang wie das 4.–6., 5. sehr kurz, kürzer als das 4. oder 6., 6.–10. schwach gezähnt, fast gleichlang. Schildchen kurz, zungenförmig, hinten nicht eingebuchtet. Elytren mit flachen Rippen und grober, flacher, undeutlicher Skulptur. Penis wie bei *turneri*.

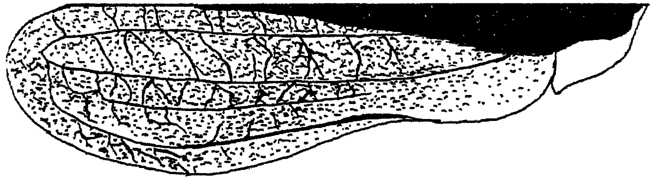
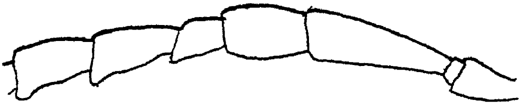


Abb. 30.



Haplolycus paradoxus, sp. n.

Länge: 11 mm. Breite (hum.): 3·5 mm., total 7 mm. Kenya Kolonie: Londiani (Mai 1936, *H. J. A. Turner*). 1 ♂.

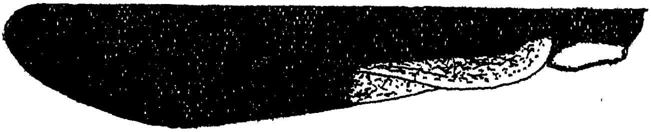
Durch die Ausfärbung der Elytren und die Gestalt des 1.–6. Fühlergliedes von allen *Haplolycus* auf den ersten Blick zu unterscheiden.

14. *Haplolycus diffusus*, sp. n. (Abb. 31, 32.)

Schwarz, Prothorax und Elytren in geringer Ausdehnung schmutziglehmgelb (Abbildung 31), überall dicht behaart. Stirn glatt, kaum etwas vertieft, Fühlerbeulen gross, in der Mitte gefurcht, Rüssel sehr kurz, kaum länger als an der Basis breit. Fühler gedrungen, 3.

Glied nur so lang wie das 4., vom 3.–10. an Länge und Breite etwas abnehmend, gezähnt, 11. länger als das 10. Prothorax quer, breiter als hoch, Ränder flach, Vorderrandskiel kurz, Furche breit, flach, Seitenränder flach erhöht, Skulptur durch Behaarung verdeckt. Schildchen kurz, verkehrt-herzförmig, Hinterrand flach eingebuchtet. Elytren mit kräftigen Rippen und grober Gitterung und Skulptur die durch Behaarung verdeckt ist. Penis Abbildung 32.

Abb. 31.



Haplolycus diffusus, sp. n.

Länge: 7–10 mm. Breite (hum.): 2 mm. (total) 3 mm. Kenya Kolonie: Yala R., S. edge Kakunga Forest, 4800–5300′; Nandi Plateau (some forest), 5700–6200′; Nandi Escarpment (forest), 5800′ (*S. A. Neave*).

4 ♂♂.

Mit keiner anderen Art zu verwechseln oder zu vergleichen. Die Variation scheint sehr gering zu sein.

15. *Haplolycus nyasanus*, sp. n. (Abb. 33, 34.)

Schwarz, Prothorax und Elytren strohgelb, mit schwarzer Zeichnung (Abbildung 33). Stirn über den flachen Fühlerbeulen grubig vertieft, Rüssel etwa dreimal so lang wie an der Basis breit. 3. Fühlerglied keilförmig, nicht ganz so lang wie das 4. und 5. zusammen, vom 4. ab schwach gezähnt und bis zum 10. fast gleichlang. Prothorax am Hinterrand etwa so breit wie in der Mitte hoch, Vorderrand abfallend, Vorderecken rundlich oder ganz fehlend, Hinterecken desgleichen, Seitenränder aufgebogen, Randpunktierung grob, tief, Behaarung ziemlich dicht. Schildchen zungenförmig, hinten gerundet, dicht behaart, Behaarung zum Teil hellgelb. Elytren mit sehr deutlichen, breiten Rippen, Quergitterung und Skulptur sind durch dichte Behaarung stark verdeckt. Penis Abbildung 34.

Länge: 16–18 mm. Breite (hum.): 3 mm. (total) 7 mm.

Nyasaland: Mlanje Plateau, 6500′ 10. xi. 1913 (*S. A. Neave*).

1 ♂, 2 ♀♀.

Schon durch die Ausfärbung auffallend. Penisautopsie sichert die Identifizierung. Die Variation scheint nicht sehr bedeutend zu sein.

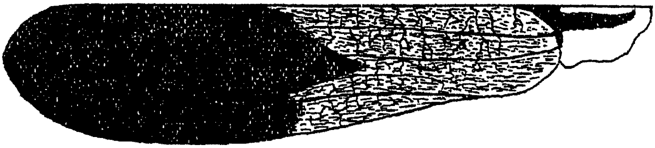
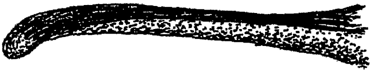


Abb. 34.



Haplolycus nyasanus, sp. n.

16. *Haplolycus reductesignatus*, sp. n. (Abb. 35, 36.)

Tiefschwarz, Prothorax und Elytren lehmgelb mit schwarzer Zeichnung (Abbildung 33). Stirn über den Fühlerbeulen flach eingedrückt, Fühlerbeulen gross aber flach und mit flacher Mittelfurche, Rüssel etwa dreimal so lang wie an der Basis breit. Fühler robust, 3. Glied länger als das 4. und 5. zusammen, 4.–10. schwach gezähnt, 11. länger als das 10. Prothorax von wechselnder Gestalt, Hinterrand breiter als in der Mitte hoch oder gleichlang. Vorderrand dachförmig abfallend, Vorderecken stumpf, Seiten geschwungen, Hinterecken schwach vorgezogen, Seitenränder aufgebogen, Skulptur ganz unscharf und durch die Behaarung verdeckt, Kiel im Vorderrandsteil kurz, Furche im Hinterrandsteil bis zur Mitte reichend. Schildchen zungenförmig, nicht eingebuchtet, kurz behaart. Elytren mit kräftigen Rippen, Gitterungsskulptur flach, durch dichte Behaarung verdeckt. Penis Abbildung 36, stark pigmentiert.

Länge : 15–17 mm. Breite (hum.) : 3–4 mm.

Kenya Kolonie : Lake Naivasha, Masai Reserve, 6000′, 20. xii. 1913 (*A. O. Luckman*) ; Rutshuru.

2 ♂♂, 2 ♀♀.

Abb. 35.

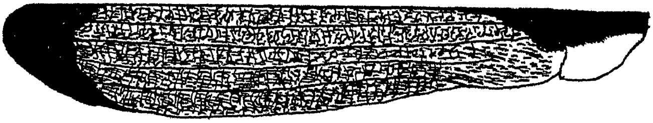
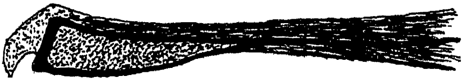


Abb. 36.



Haplolycus reductesignatus, sp. n.

Die Variation ist scheinbar nur gering und auf die Schwarzfärbung am Hinterrand beschränkt, aber auch hier ist der Umfang nur gering.

Abb. 37.

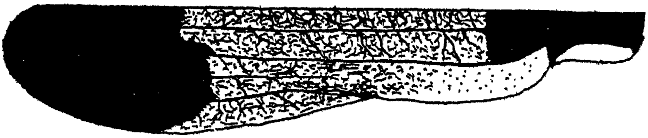
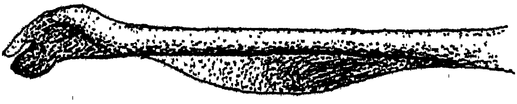


Abb. 38.



Haplolycus signicollis, sp. n.

17. *Haplolycus signicollis*, sp. n. (Abb. 37, 38.)

Abdomen schwarz, Ränder lehmgelb, Brust, Kopf, Fühler, Beine und Schildchen schwarz, Prothorax schwarz mit gelben Rändern, Elytrenausfärbung Abbildung 37. Stirn flach eingedrückt, über den flachen Fühlerbeulen grubig, punktartig vertieft. Fühler schlank, 3. Glied länger als das 4. und 5. zusammen. Prothorax quadratisch, Vorderrand gerade, Vorderecken und Seiten mehr oder weniger gerade, Hinterecken wenig vorstehend, Seiten sehr stark aufgebogen, Skulptur daselbst zart. Schildchen zungenförmig, Hinterrand gerade. Elytren mit flachen Rippen und grober, runzeliger Skupltur. Penis Abbildung 38.

Länge : 10 mm. Breite (hum.) : 3 mm., total : 7 mm. circa.

Kenya Kolonie : Kisumu (April 1936, *H. J. A. Turner*). 1 ♂.

Durch den aufgebogenen Prothorax und das lange 3. Fühlerglied von grossen Stücken von *minimus* schon äusserlich zu unterscheiden. In Zweifelsfällen muss Penisautopsie entscheiden.

Abb. 39.

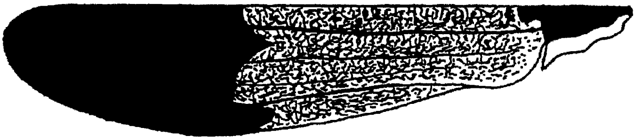
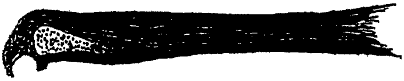


Abb. 40.



Merolycus chirindanus, sp. n.

18. *Merolycus chirindanus*, sp. n. (Abb. 39, 40.)

Eine kleine, mehr an *Lopholycus* erinnernde Art. Tiefschwarz, Prothorax mit gelben Seitenrändern, Elytren in der basalen Hälfte schmutzig-lehmgelb. Stirn gross, flach eingedrückt, Fühlerbeulen sehr klein, Rüssel viermal so lang wie an der Basis breit. 3. Fühlerglied so lang wie das 4.–6. zusammen, 4.–6. mehr oder weniger, 5.–7. stärker gezähnt, die Glieder bis zum 10. an Länge und Breite abnehmend, 11. länger als das 10. Prothorax dreieckig, am Hinterrand so breit wie in der Mitte hoch, Vorderrand steil abfallend, Ecken fehlen, Hinterecken spitz vorgezogen, Vorderrandskiel nur sehr kurz und schwach, Furche lang, auf der Mitte lang-dreieckig erweitert, Ränder schmal aufgebogen, Randpunktierung kräftig. Schildchen kurz, zungenförmig, Hinterrand gerade. Elytren fettig glänzend, Rippen und Skulptur kräftig, keine Bahaarung. Hinterschenkel sehr stark verdickt und gedornt. Penis Abbildung 40.

Länge : 9–10 mm. Breite (hum.) : 3 mm.

Mashonaland : Chirinda, Okt. 1905 (*G. A. K. Marshall*). 2 ♂♂, 1 ♀.

Man wäre geneigt, diese kleine Art, die ganz und gar nicht in die Tribus hineinpasst etwa mit *Lopholycus sibutensis* Pic zu vergleichen. Die Gestalt der Beine weist die Art aber bestimmt zu *Merolycus*.

19. *Merolycus simulator*, sp. n. (Abb. 41, 42.)

Abdomen rotbraun, mit Ausnahme des letzten Segments, an den Seiten breit gelb, Brust schwarz, fuchsrot behaart, Kopf, Fühler und Schildchen schwarz, Prothorax und Elytren lehmgelb mit schwarzer Zeichnung (Abbildung 41), Beine schwarz, Hüften und Schenkelbasis gelbbraun. Stirn von Auge zu Auge über den flachen Fühlerbeulen eingesenkt, Rüssel etwa 2½ mal so lang wie an der Basis breit, keilförmig nach vorn verengt. 3. Fühlerglied so lang wie das 4. und 5. zusammen, vom 4.–10. allmählich an Länge, weniger an Breite abnehmend, gezähnt, 11. länger als das 10. Prothorax am Hinterrand so breit oder breiter als in der Mitte hoch, Vorderrand abfallend, Ecken gerundet, Hinterecken stumpf, Seiten kräftig aufgebogen, Randskulptur stark, Vorderrandskiel kurz, breit, Furche nur angedeutet. Schildchen

Abb. 41.

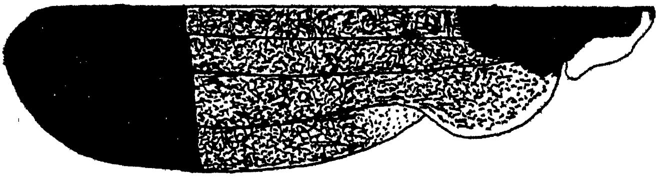
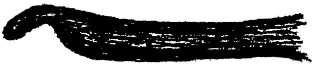


Abb. 42.



Merolycus simulator, sp. n.

verkehrt-herzförmig, am Hinterrand keilförmig eingebuchtet. Elytren mit stark vorspringenden Schultern, Rippen kräftig, die 3. aber ganz obsolet, Quergitterung durch die grobe, grosse Grundskulptur ganz verdeckt. Hinterschenkel stark verdickt und gezähnt. Penis Abbildung 42.

Länge : 14 mm. Breite (hum. und total) : 5 mm.

Nyasaland : S.E. shores L. Nyasa, between Ft. Maguire and Ft. Johnston, 6–17 Mch., 1910 (*S. A. Neave*).

2 ♂♂, 1 ♀.

Auch diese Art sieht keinem *Merolycus* ähnlich, sondern manchen *Lopholycus*-Arten. Die Gestalt der Hinterschenkel lässt aber über Zugehörigkeit zu *Merolycus* keinen Zweifel aufkommen.

Abb. 43.

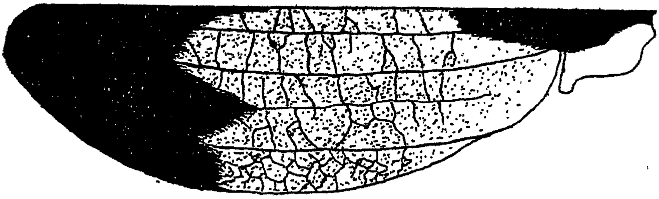
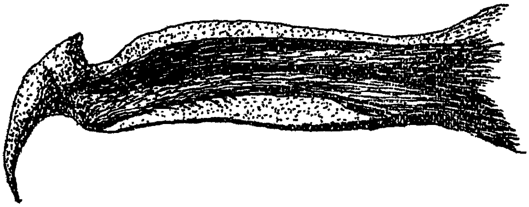


Abb. 44.



Lycus serenus, sp. n.

20. *Lycus serenus*, sp. n. (Abb. 43, 44.)

Abdomen dunkelbraun, Seiten, mit Ausnahme des letzten Segmentes schmal gelb gerandet, Brust, Kopf, Fühler, Schildchen und Beine schwarzbraun, Prothorax und Elytren hell-irdenfarbig mit schwarzer Zeichnung (Abbildung 43). Stirn über den Fühlerbeulen tief, halbelliptisch eingesenkt, Fühlerbeulen kräftig, Rüssel etwa dreimal so lang wie an der Basis breit. 3. Fühlerglied länger als das 4. und 5. zusammen, 4.–10. schwach

gezähnt, 10. Glied kürzer als das 9, 11. kaum länger als das 9. Prothorax am Hinterrand breiter als in der Mitte hoch, Vorderrand wellig, Vorderecken obsolet, gerundet, Hinterecken gross, stumpf, nach aussen vorgezogen, Vorderrandskiel kurz, Furche in der hinteren Hälfte kaum angedeutet, Seitenränder stark erhöht, Randpunktierung nicht sehr stark, keine Behaarung. Schildchen klein, schmal, zungenförmig, am Hinterrand gerade. Auf den Elytren sind Längs- und Querrippen nicht sehr stark aber deutlich ausgebildet, Skulptur sehr fein, keine Behaarung. Penis Abbildung 44, gedrungen und stark pigmentiert.

Länge: 13–15 mm. Breite (hum.): 3 mm. (total): 11 mm.

Kenya Kolonie: Lusinga I., E. Victoria Nyanza (*S. A. Neave*).

1 ♂.

Die Art ist manchen anderen *Lycus* ähnlich. In Zweifelsfällen ist der ganz eigenartig gebaute Penis zu vergleichen. Es ist eine absolut sichere Art.

XXXII.—*Descriptions and Records of Bees.*—CLXXII.

By T. D. A. Cockerell, University of Colorado.

All the bees recorded in this part are the property of the British Museum.

Cœlioxys (*Liothyrapis*) *torrida* Smith.

Uganda: Mbale–Kumi Road, S. of L. Salisbury, 3700 ft., Aug. 15–17, 1911, male (*S. A. Neave*).

On reviewing the matter I conclude that *C. furcata* Friese cannot be separated from *C. torrida*. The southern form, *C. torrida alivalensis* (Cockerell), has distinctly red legs and more hair on the abdomen beneath, but it is no more than a rather poorly defined race. It is represented in the material now before me by both sexes from Queenstown, C.P., 3500 ft. (*E. T. Wells, R. E. Turner*), and a male from Matjesfontein, November (*Turner*).

Cœlioxys (*Liothyrapis*) *pachyura* Cockerell.

Cape Province: Matjesfontein, both sexes, Oct., Nov. (*R. E. Turner*); Aliwal North, 4350 ft., Jan. (*Turner*).

The male has red tibiæ and tarsi, or entirely black legs; the upper apical spines of abdomen are not divergent as they are in *C. verticalis* Smith. There is a small median spine, visible in some specimens but not in others. Males were collected by R. Crawshay in Basutoland.

Cœlioxys (*Liothyrapis*) *umbripennis* (Friese).

N. Rhodesia: Mid-Luangwa Valley, Aug. (*S. A. Neave*); Feira, May (*F. V. Bruce Miller*).

Cœlioxys (*Liothyrapis*) *chionospila* Cockerell.

N. Rhodesia: Upper Luangwa River, July–Aug. 1910 (*Neave*).

A small male, only 12 mm. long.

Cœlioxys (*Liothyrapis*) *luangwana*, sp. n.

♀.—Length about 13 mm., anterior wing 8.

Black, including mandibles, antennæ, and tegulæ (except a dark brown boss), but legs dark rufescent, the anterior tibiæ red in front, all the tibiæ red at tip, the tarsi red; eyes very pale grey, bare; pubescence mainly pure white, but short brown hair on lower middle of clypeus; sides of thorax with much white hair, and long white hair on metathorax; tergites 1 to 5 with dense bands of pure white hair (not scales), narrow in middle, moderately broadened at sides; venter with much white hair, but fifth sternite bright red, convex, bare, except for a white marginal fringe; frontal keel weak and inconspicuous; mesothorax and scutellum dull, with very minute punctures; axillæ without projecting spines. Wings brownish; first recurrent nervure ending more than twice as far from base of second cubital cell as second from apex. Abdomen dullish, with small punctures; sixth tergite dull and not keeled basally, but apically with a shining keel which ends in a sharp upturned spine; apical sternite very broad and rounded, covered above with brown hair, and having a small spine on middle of apical margin.

N.E. Rhodesia: Upper Luangwa River, July 27–Aug. 13, 1910 (*S. A. Neave*).

A distinct species, easily recognized by the abdominal structures and red fifth sternite. It may be compared with *C. lativentris* Friese, but it differs by the entirely hairy face, short axillæ, and the various characters of the abdomen.

Cœlioxys (*Liothyrapis*) *heterozona*, sp. n.*

♀.—Length 11·3 mm., anterior wing 6·7.

Black, including mandibles, antennæ, tegulæ (faintly brownish posteriorly), and legs; wings dark fuliginous as far back as the basal nervure, but hyaline basally; pubescence white, face hairy all over; facial quadrangle long and narrow, the orbits slightly converging above; middle of supraclypeal area highly polished; no distinct keel on middle of front, but a pair of strong straight keels, ending above at each side of middle ocellus; venter on each side of ocelli shining; eyes bare, pale brown, dark brown in front; mesothorax and scutellum strongly and closely punctured, moderately glistening; white hair, tending to form two ill-defined patches, on mesonotum in front, a narrow line of white hair over tegulæ and along front margin of scutellum; scutellum large, broadly rounded behind; axillæ very short; mesopleura with white hair around margins, but the strongly punctured disc exposed; recurrent nervures near ends of second cubital cell; abdomen shining, first tergite densely punctured above the punctures, running in lines, second strongly but more sparsely punctured, third with very minute punctures basally but larger apically, fourth and fifth with very minute punctures; tergites with linear bands consisting of one row of narrow scale-like hairs; second and third with interrupted subbasal bands, that on third evanescent; apical plates of about equal length, the last tergite ending in a sharp point, which is not turned upward, and with some long hairs; last sternite rather narrow, but evenly rounded, with no hairy fringe or apical point.

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* Major F. Moysey writes that *C. heterozona* was taken by him "in the Nuba Mountains in the Sudan in 1921–22. The actual spot is between Heiban and Delami in the Koaleb Hills."

East Africa, 1923 (*Capt. Moysey* ; Brit. Mus. 1931—538).

A peculiar little species, evidently related to *C. verticalis* Sm. and *C. rotundicauda* Ckll., but known by the slender form and bare eyes combined with slender abdominal bands of narrow scale-like hairs. The last sternite is much narrower than in *C. decipiens* Spinola. In Friese's table it runs to *C. junodi* Fr., which differs in wings and abdomen. Undoubtedly the nearest affinity is with *C. verticalis,* but that species, from Natal, is considerably more robust, the end of the abdomen not so slender, the hair on inner side of hind basitarsi rich orange-fulvous. Smith describes the tarsi of *C. verticalis* as ferruginous, but I find them dusky, not conspicuously red.

On going over the *Cœlioxys* from West Africa I find other specimens of *C. heterozona,* labelled Aburi, Gold Coast (*A. R. Gould*), River Niger, S. Nigeria (*J. J. Simpson*), and Minna, N. Nigeria (*J. W. Scott-Macfie*). I also find that the tropical African form which I have (Rev. Zool. Bot. Afr. xxvi. 1935) referred to *C. verticalis* Sm. is more or less intermediate between *C. verticalis* and *C. heterodoxa,* and possibly represents a third species. Specimens of this sort now before me are from Faradje, Belgian Congo (*Lang* and *Chapin*), Njala, Sierra Leone (*E. Hargreaves*), Tamale, Gold Coast (*Dr. C. E. S. Watson*), Tamsoo, Gold Coast, and Brit. Nyive, Gold Coast. I am labelling these *C. verticalis,* variety, for the present.

Cœlioxys (*Liothyrapis*) *cherenensis* Friese.

Sudan ; Gendettu, Jan. 25, 1925, " from ads sudani," ♀ (*W. E. Giffard*).

Cœlioxys (*Liothyrapis*) *decipiens* Spinola.

Sudan : Mogran, on berseem, Jan. 18, 1929, ♀ (*H. W. Bedford*).

I suppose that " berseem " is *Trifolium alexandrinum* L.

The following species all have hairy eyes and belong to *Cœlioxys* proper :—

Cœlioxys difformis Friese.

Cape Province : Matjesfontein, both sexes (*R. E. Turner*) ; Little Karroo, 38 miles E. of Ceres (*Turner*).

Cœlioxys loricula Smith.

Gold Coast: 1913, ♂ (*A. E. Evans*).

The dark legs distinguish it from the red-legged *C. caffra* Friese, but I am not sure that the species are distinct.

Cœlioxys caffra Friese.

Kenya: around Marsabit, Oct. 1911, 10 ♀, 1 ♂ (*C. A. Neave*); Marsabit, 1 ♀, and three labelled "Africa" (*Stordy*).

The male, not described by Friese, is almost the same as *C. loricula* Sm., but with red legs. It is also close to *C. auriceps* Friese, but the lower apical spines are only moderately divergent.

These insects belong to the group of *C. capensis* Sm.

Cœlioxys natalensis Cockerell.

N.E. Rhodesia: females collected by Neave near Petauke, 2400 ft., and near mouth of Lusangazi River.

Nyasaland: females collected by Neave at Mlanje, 2300 ft., and Domira Bay, W. shore of L. Nyasa.

Katanga: Lufira River, 3500 ft. (*Neave*). Also one labelled E. Africa, 92–23.

Cœlioxys truncaticauda Cockerell.

S.W. Africa: Aus, Jan. 1930, ♂ (*R. E. Turner*).

Cœlioxys cæruleipennis Friese.

S. Rhodesia: Lonely Mine, March 4, 1915, ♀ (*H. Swale*).

Cœlioxys dereptans Cockerell.

N. Rhodesia: Algoa, May 3, 1910, ♀ (*Silverlock*).

Cœlioxys ruwenzorica, sp. n.

♂.—Length about 11 mm., anterior wing about 8·7.

Black, including mandibles, antennæ, tegulæ, and legs; fifth tergite without lateral teeth or swellings; sixth tergite with six teeth, the lateral (basal) ones very short, standing out as angular processes, beyond which the tergite is much narrower; anterior coxæ with slender spines. Orbits converging below; face and front densely covered with long reddish-white hair and with no keel; there is a fringe of very long hairs on each side of the ocelli; cheeks with dense pure white hair; eyes reddish brown, with rather long hair; mesonotum glistening, with coarse punctures; scutellum dull, very densely punctured, rounded behind, not angular; spines of axillæ rather long, flattened; sides of thorax with abundant white hair, but no dorsal spots except a pair of small linear marks at base of scutellum. Wings with the apical margin pale brown; recurrent nervures about equally distant from ends of second cubital cell. Legs with white hair, dense on outer side of tibiæ; front basitarsi with a very conspicuous broad stripe of pure white hair on outer side; hind spurs reddish. Abdomen glistening, first tergite with a very large triangular patch of pale hair on each side, second to fourth with dense broad bands at sides, narrowing to a line in middle, the elements linear, hardly to be called scales; fifth tergite with a narrow fringe; sixth short, the upper apical teeth much shorter than the lower; the upper teeth appearing sharply angular in one view, broad and truncate in another, the lower teeth obtuse as seen from above, sharp as seen from the side; at each side, beneath the sixth tergite, a rounded lamella projects; venter with broad hair-bands, interrupted in middle, margin of fourth sternite polished in middle, not emarginate, fifth with a conspicuous pit.

Mt. Ruwenzori, 5300 ft. (*Scott Elliot*).

Related to *C. planidens* Friese, but the end of the abdomen is quite different.

Cœlioxys cyanura Cockerell.

Uganda: Entebbe, Sept. 1911, ♀ (*S. A. Neave*).

Cœlioxys furcaticauda, sp. n.

♂ (type).—Length about 13 mm., anterior wing 8·5.

Robust, black, including mandibles, antennæ, tegulæ, and legs; eyes pale grey, with long hairs; pubescence pure white, covering face, cheeks, except upper part, sides of thorax (the hair long and dense), forming two small transverse marks at base of scutellum, a spot next to outer side of base of axillæ, a dense fringe beneath axillæ, long hair at sides of metathorax, dense white hair on outer or posterior side of femora, tibiæ, and basitarsi (but pale orange on inner side of tarsi), abdominal bands linear in middle, expanded laterally, on first tergite forming a broad band along sides, on fifth reduced to a pyriform spot on each side, sixth with white hair at base, and a large dense patch on each side, venter with broad bands on first four sternites, a narrow one, broken in middle, on fifth ; no keel on clypeus, a weak one between antennæ ; vertex glistening, with very coarse punctures ; mesonotum very coarsely punctured, shining only in middle, where the punctures are not so dense ; scutellum very rugose, rounded behind ; spines of axillæ well developed, but not so long as the part before the spine. Wings brownish hyaline ; basal nervure meeting nervulus ; recurrent nervures joining second cubital cell equally far from (but not close to) base and apex. On under side of each cheek an oval black spot surrounded by white hair ; front coxæ not spined ; tergites well punctured, with strong transverse sulci ; fifth tergite with an apical tooth at each side ; sixth with a small basal tooth at each side, but rapidly narrowing to a snout-like end, which is deeply bifurcate ; there are two pairs of upper apical tubercles, the first appearing as a projection on each side, when the abdomen is seen from above, the second as an obtuse projection above in lateral view ; second sternite with rather small punctures, third and fourth with larger ones on a polished ground, fifth dull, very minutely rugulose, with thin hair.

♀.—Length about 12 mm.

Mandibles red in middle ; clypeus very densely punctured ; mesonotum more shing ; white marks at base of scutellum very small ; last tergite dull, keeled in middle, broadly truncate at end, with a narrow stripe of white hair at each side ; last sternite produced beyond tergite, not very broad, but obtuse, rounded at end, not notched at sides.

Orange Free State : Harrismith, 5321 ft., Feb. and March 1927, 6 ♂, 1 ♀ (*R. E. Turner*).

Cœlioxys furcaticauda coloratula, subsp. n.

♂.—Averaging a little smaller ; mandibles red in middle ; flagellum dusky red beneath ; legs red ; under side of abdomen partly red. There is some variation, the femora and under side of abdomen may be black, and the flagellum only faintly reddish. The tegulæ are reddish.

Cape Province: Matjesfontein, 2955 ft.; Nov. and Dec. 1928, 5 ♂ (*R. E. Turner*).

The structure of the male abdomen in this species is quite distinctive; occasionally the upper apical tooth is bifid. The female is near *C. dereptans* Ckll., which differs by the angular last sternite, the much broader white bands along sides of apex of abdomen, and the smaller scutellum, with very conspicuous white marks at base. *C. furcaticauda* female has a pair of widely separated strong teeth on under side of head. It is also related to *C. aspericauda* Ckll., but that has very short hair on eyes and the last tergite not keeled.

Cœlioxys unicula, sp. n.

♂.—Length 9·5 mm., anterior wing 7.

Black, including antennæ, but mandibles red (black at end), tegulæ dark red, and legs red; pubescence white, covering face, cheeks, and sides of thorax; a fringe of dull white hair along front margin of mesonotum, but no spots; an interrupted narrow white band at base of scutellum; hair of legs rather thin; tergites with the apical bands broadened at sides but linear and weak in middle, but rather broad basal bands on tergites 2 to 6; venter reddish, with white hair-bands, broad on second and third sternites; eyes pale grey, with short hair; no keel on middle of front or clypeus, or at sides of front ocelli; no black spots on under side of head; front coxæ with small spines; mesothorax and scutellum very coarsely and densely punctured; scutellum very short, not at all angular; spines of axillæ long. Wings hyaline, the outer margin light brown; basal nervure meeting nervulus; first recurrent nervure ending nearer (very close to) base of second cubital cell than second to apex. Abdomen well punctured, the fourth tergite in middle with a large triangular polished and rather sparsely punctured area; a similar area on fifth is more closely punctured; last tergite rather short, very deeply sulcate in middle, as seen from above ending in two short divergent blunt teeth, anterior to which on each side is an angular projection, which is the upper apical tooth; in side view the tergite appears thick and short, obliquely truncate, with a dentiform angle at each corner of the truncation;

the sides of the base of the sixth tergite have long spines; seen from above, sharp spines project from the lateral bases of tergites 3 to 5, but they are really on the apical margins of 2 to 4, and are the projecting corners seen in such a position as to simulate spines; the fifth tergite is swollen on each side, but does not appear spiniform; the first sternite has a broad band of white hair in middle.

S. Rhodesia: Lonely Mine, Dec. 3, 1913 (*H. Swale*).

In my artificial table this ran out next to *C. furcaticauda coloratula*, differing by the much narrower face. The resemblance is, however, only superficial, and there is no close affinity. The end of the abdomen in lateral view is like that of *C. atopura* Ckll., which is otherwise very different. There is a general resemblance to *C. liberiensis* Ckll., which has the apical teeth of abdomen much stouter. The same is true of *C. planidens* Friese, which is somewhat allied.

Cœlioxys otaviensis Cockerell.

S. Rhodesia: Lonely Mine, April 9, 1914, ♂ (*H. Swale*).
N. Rhodesia: Sinapunga, Feb. 13, 1911, ♂ (*Silverlock*).

Cœlioxys somalina Magretti.

N.E. Rhodesia: Upper Luangwa River, July–Aug. 1910 (*S. A. Neave*), and Mid-Luangwa Valley (*Neave*).

Five males of the species which I have recorded from Nyasaland as *C. somalina* (Ann. & Mag. Nat. Hist., May 1933, p. 551). A female from Upper Luangwa River (*Neave*) may belong here; it is very like *C. capensis* Smith, but is not so robust, the last sternite is narrower, and the spines of the axillæ are much shorter. The male is very distinct from *C. capensis*.

Cœlioxys nigripes Vachal.

Sierra Leone: Free Town, Sept. 21, 1899 (*E. E. Austen*).
N. Nigeria: Bokani, Oct. 5, 1910, ♀ (*J. J. Simpson*).

I refer this to *C. nigripes*, as it agrees with Vachal's too short description of a female from Gabon.

Length about 12 mm.

Face with white hair, dense at sides; front feebly keeled; eyes with very short hair; anterior coxæ with small dentiform projections; a band of white hair, failing in middle, along anterior margin of scutellum; hind margin of scutellum not angulate; spines of axillæ long; abdominal bands very slender except at sides; apical sternite rather narrow, pointed, not at all notched at sides. According to Vachal the fifth sternite is more densely and finely punctured than those before, but in my specimens this is only slightly the case. On the other hand, the related *C. chubbi* Ckll. has the sculpture of the fourth and fifth sternites quite different.

Cœlioxys friesei, nom. nov.

Cœlioxys nigripes Friese, 1905, from Chile (not *C. nigripes* Vachal, 1903).

There is a specimen in the American Museum of Natural History.

Cœlioxys spilaspis, Cockerell.

Cape Province: Somerset East, Dec. 1930, ♂ (*R. E. Turner*).

Looks like *C. afra*, but lacks the subbasal marks (hair-spots or bands) on tergites.

Cœlioxys afra pusilla (Gerstaecker).

Cape Province: Queenstown (*Turner*); Ceres (*Turner*). Natal: Weenen, ♂ (*Thomasset*).

XXXIII.—*Further Records of the Occurrence of* Myialges *and* Microlichus (*Acarina*) *on Mallophaga and* Hippoboscidæ. By Gordon B. Thompson.

[Plates X. & XI.]

In a recent paper (Thompson, 1936) I recorded for the first time the occurrence of some very small mites, *Myialges* sp., on a large species of Mallophaga (*Trinoton* spp.). Through the kindness of Mr. Carlton Herman, I have recently received a specimen of *Trinoton* collected from a red-breasted merganser in North America which bears mites together with numerous eggs. Another specimen of a *Trinoton* bearing a mite and taken from a gargeney teal in Ceylon has also come to hand. My own previous records were from *Trinoton* spp. collected off ducks and geese in Uganda. These new records from North America and Ceylon are, therefore, worthy of note. I am now in the fortunate position of being able to present illustrations of these mites on the Mallophaga, and this paper containing a few additional records of the occurrence of these interesting mites on ectoparasitic Arthropoda is a convenient opportunity to present them (see Pls. X. & XI.). For these excellent photographs I am greatly indebted to Dr. J. W. Shackle, who has spared no effort in achieving these splendid results.

The *Trinoton querquedulæ* (Linn.) sent by Mr. C. Herman is a male collected from a red-breasted merganser (=*Mergus serrator* Linn.) (6. vii. 1937), and has two mites together with a few eggs attached to the side of the louse between the metathorax and the first segment of the abdomen (*i. e.*, just posterior to the third leg). The mites appear to be very similar to *Myialges caulotoon* Speiser, but I would hesitate to say that they are that species. The position occupied by these mites corresponds exactly to that described in my previous paper (Thompson, 1936).

The single female of *Trinoton querquedulæ* (Linn.) from Ceylon was collected from a female gargeney teal (*Querquedula querquedula* Linn.) at Panama, E.P., south of Pottuvil, Ceylon, 26. iii. 1938, by Capt. W. W. A. Phillips. In the case of this louse the mite is present without eggs and is attached just above the extremity of the femora of the right hind leg. This is the first time I have seen one of these mites attached to a part of the louse other than the thorax or abdomen. In view of the absence of eggs it is probable that the mite had not taken up its final position before depositing its eggs. The mite can again be referred to a species of *Myialges*.

To the bibliography of papers containing records of *Myialges* on Hippoboscidæ given in my previous paper the following should be added :—

F. C. Bishopp (1929), J. Econ. Ent. xxii. p. 980, recorded *Myialges* sp. on *Pseudolynchia maura* (Bigot) in Florida.

C. M. Herman (1937), Bird-Banding, viii. p. 165, recorded Myialgesinæ parasitising some of the Hippoboscidæ collected from birds at the Austin Ornithological Research Station, Cape Cod, Massachusetts, but did not give details of the records.

New Records of Microlichus *spp.*

(1) One mite (without eggs) at base of R. wing and two mites (without eggs) at base of L. wing of *Ornithomyia avicularia* (Linn.), ♀, off *Turdus m. merula* (Linn.), Wiltshire, West Lavington, v. 1937 (*B. W. H. Coulson*).

(2) One mite with eggs at base of wing of *Ornithomyia fringillina* Curtis, ♂, off *Anthus spinoletta petrosus* (Montagu), Skokholm Island, 28. vi. 1937.

(3) Mites with eggs on either one or both wings of *O. fringillina* Curtis, 4 ♀♀, off *Lagopus s. scoticus* (Latham), Argyllshire, Inveraray, viii. 1936 (*Dr. J. W. Campbell*).

(4) Mites with eggs at base of wing and on abdomen of *Ornithomyia fringillina* Curtis, 1 ♀, off *Emberiza s. schœniclus* (Linn.), E. Renfrewshire, 21. vii. 1937 (*P. A. Clancey*).

(5) Mites without eggs at base of both wings of *O. avicularia* (Linn.), ♀, off *Turdus m. merula* Linn., 2. viii. 1938.

(6) Mites with eggs at base of both wings of *O. avicularia* (Linn.), ♂, off *Prunella modularis occidentalis* (Hart.), 4. viii. 1938.

(7) Mite with eggs at base of R. wing of *O. avicularia* (Linn.), ♀, off *Prunella modularis occidentalis* (Hart.), 18. viii. 1938.

(8) Mites with eggs on both wings of *O. fringillina* Curtis, ♀, off *Prunella modularis occidentalis* (Hart.), 18. viii. 1938.

These last four records are all based on specimens collected at Hartley, Longfield, Kent (*A. Clark*).

The presence of mites without eggs on the Hippoboscid in the first record probably indicates that the mites had only recently taken up their position on the wings. The date of capture of the Hippoboscid is earlier than any others known to me in which these mites have been found.

REFERENCES.

THOMPSON. 1936. Ann. & Mag. Nat. Hist. ser. 10, vol. xviii. pp. 315–320.

EXPLANATION OF THE PLATES.

PLATE X.

Figs. a–d. Portions of *Trinoton* sp. with *Myialges caulotoon* Speiser attached.

PLATE XI.

Fig. a. *Myialges caulotoon* Speiser, ♀.
Fig. b. Portion of abdomen of *P. maura* (Bigot) with specimens of *M. anchora* Serg. & Trous. attached.
Fig. c. Base of wing of *O. avicularia* (Linn.), ♀, with *Microlichus* sp. ♀♀ attached to the underside.

XXXIV.—*The Pseudoscorpionidea collected by the Percy Sladen Trust Expedition to Lake Titicaca.* By M. BEIER, Vienna.

THE small collection, which I have received for study from the British Museum (Natural History), contains three species. One of these is a new one and belongs to a new genus.

PARASERIANUS, gen. nov.

Carapace longer than broad, the hind margin very strongly arched, convex. Four eyes. Tergites divided, weakly sclerotic. Flagellum with four blades. The tactile setæ *ib*, *isb*, *ist*, and *it* of the palps closely grouped at the base of the fixed finger, *ib* a little more solitary and distinctly more proximal in position; in the distal half of the fixed finger the tactile seta *et* only. The movable finger with three tactile setæ only, because *t* is absent. Patella of the fore legs longer than the femur and practically immobile. Metatarsus of the hind legs with a long tactile seta basally. Empodium bifurcate, longer than the claws.

Geographical distribution: Bolivia.

Type-species: *Paraserianus bolivianus*, sp. n.

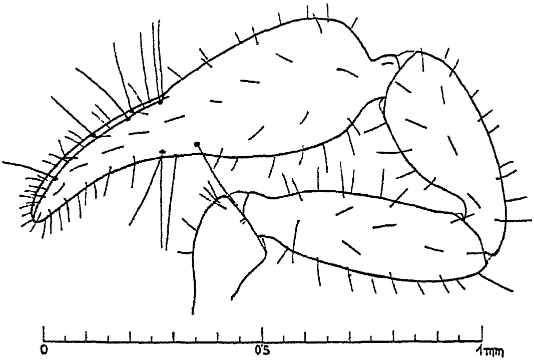
The new genus is closely related to *Serianus* Chamb. (Olpiidæ–Garypininæ), but the movable finger of palps bears three tactile setæ only, because the seta *t* is absent.

Paraserianus bolivianus, sp. n. (Fig. 1.)

Carapace considerably longer than broad, strongly sclerotic, with well-developed eyes, the hind margin very convex, strongly arched. Tergites weakly sclerotic, completely divided, except the last tergite, which is entire. Six marginal setæ on each tergite (three on each half-tergite). Each of the two last sternites with two pairs of long subtactile setæ. Sternites 5 to 7 of the male each with a median pair of rather long setæ. Galea rather strong, with three branches terminally. Flagellum with four almost equally developed blades. Serrula with 16 blades. Femur of the palps 3·2 times, tibia 2·5 times, chela 3·2 times as long as broad. Tibia shorter than the femur. Fingers a little shorter than the hand without the stalk. Fixed finger with 21 greater and basally with 4 flat teeth, movable finger with 13 well-developed and proximally with about 9 flat and rudimentary teeth. The tactile setæ *ib*, *isb*, *ist*, and *it* in a group at the base of the fixed finger situated, *ib* a little more proximal and separated from the other three members of the group ; in the distal half of the fixed finger the tactile seta *et* only. Movable finger with three tactile setæ only, because *t* is absent.

Length of body 2·5 to 3·3 mm. Palps : femur, length 0·57 mm., breadth 0·18 mm.; tibia, length 0·50 mm., breadth 0·20 mm.; hand, length 0·55 mm., breadth 0·29 mm.; fingers, length 0·42 mm.

Fig. 1.



Paraserianus bolivianus, gen. et sp. n.
Right palp of the female.

Type.—1 ♀, Pazña, Bolivia, 14. viii. 1937, Titicaca Expedition (Brit. Mus. no. 1938.11.16.1).

Paratypes.—9 adults of both sexes and 12 juv., Pazña, Bolivia, cracks in stones and rocks on dry hills, ca. 12,000 ft., 14. viii. 1937, Titicaca Expedition (Brit. Mus. no. 1938.11.16.2–6).

Cordylochernes costaricensis Beier.

1 ♂ and 1 juv. from Cholumani, Bolivia, 9–10. vi. 1937 (Brit. Mus. no. 1938.11.16.7–8), seem to be identical with

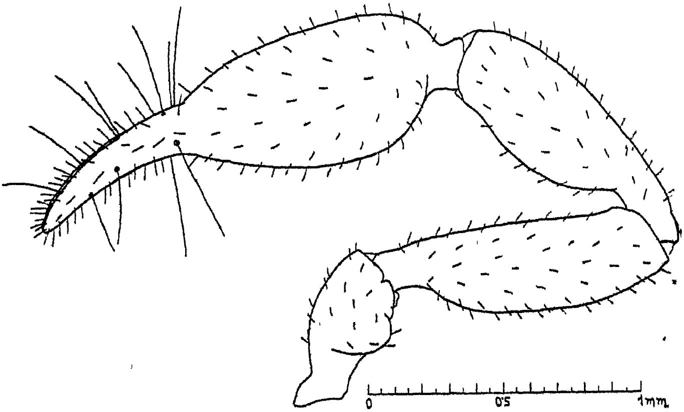
this species (and not with *peruanus* m.), because the measurements of the palps are in agreement with the former. Therefore, *C. costaricensis* seems to be more widely distributed.

Parazaona bocki (Tullgren). (Fig. 2.)

2 ♂♂, 1 ♀, Capachica, Peru, 30. iv. 1937 (Brit. Mus. no. 1938.11.16.9–11); 1 ♂, Capachica, 25. vi. 1937 (Brit. Mus. no. 1938.11.16.12); 1 ♀, Capachica, 20. vii. 1937, in the porridge (Brit. Mus. no. 1938.11.16.13).

The specimens differ from the types from Bolivia only by the palps being a little smaller and in the following insignificant characters: serrula with 20 blades (the types have 22). Femur of the palps 3·4 times, tibia 3 times, chela 3·5 times as long as broad. Fixed finger of the palps medially with 3, laterally with 8, movable finger medially with 5, laterally with 5 accessory teeth. Length of the body of the female at most 4 mm. Measurements of the palps: femur, length 1·07 mm., breadth 0·32 mm.; tibia, length 1·05 mm., breadth 0·36 mm.; hand, length 1·07 mm., breadth 0·50 mm.; fingers, length 0·70 mm.

Fig. 2.



Parazaona bocki (Tullgr.).
Right palp of the male.

XXXV.—*Wealden and Purbeck Ostracoda.*

By F. W. ANDERSON, M.Sc.

[Plates XII. & XIII.]

INTRODUCTION.

In three important papers published by T. R. Jones (1878, 1885, 1888), a complete revision of the Wealden and Purbeck Ostracoda was attempted. The difficulties to be overcome were considerable. Previous authors had not considered it necessary to designate a holotype from amongst the many individuals usually found attached to the same rock specimen, nor had they isolated the carapaces of the specimens they figured from the matrix, so that details of the hinge and ventral overlap, and in some cases even the general outline were obscured.

T. R. Jones, especially in his 1885 paper, established the majority of the then known species on a much sounder basis, re-figuring and re-describing them quite adequately, and, in addition, created many new species.

Wealden and Purbeck Ostracoda, and especially the latter, are, however, not as a rule easy to extract from the matrix, and the building up of a collection sufficiently large for systematic study requires much time and patience. Consequently, though the writer, whilst working on this group of fossils during the past ten years, has been constantly aware of systematic errors requiring attention and of the presence of many hitherto undescribed species, it was not found possible to accumulate enough material for a satisfactory revision by the usual methods of collecting. The borings recently put down by the Anglo-Iranian Oil Company and the D'Arcy Exploration Company in their search for oil have, however, provided a vast amount of material of excellent quality. Through the courtesy of these Companies, and especially of Messrs. P. T. Cox and A. H. Taitt, to whom I am deeply indebted, I have been allowed to examine the Wealden and Purbeck samples recovered from these wells.

The object of the present communication is to describe some of the newly discovered species and to outline a revised classification of the whole ostraced fauna.

Details of the occurrence and discussion of the zonal distribution of the Wealden and Purbeck Ostracoda are left to be dealt with in a subsequent paper.

CLASSIFICATION.

The Wealden and Purbeck Ostracoda belong to the two families Cypridæ and Cytheridæ which are represented by eleven genera. The following revised classification is suggested :—

I. Family CYPRIDÆ Zenker.

- *a.* Subfamily ROSTROCYPRINÆ, nov.
    1. Genus CYPRIDEA Bosquet.
        Species : *aculeata* Jones, *adjuncta* Jones, *dunkeri* Jones, *fasciculata* (Forbes), *granulosa* (J. de C. Sowerby), *indigens* nov., *paucigranulata* Jones, *punctata* (Forbes), *spinigera* (J. de C. Sowerby), *tuberculata* (J. de C. Sowerby), *verrucosa* Jones.
    2. Genus ULWELLIA, nov.
        Species : *bispinosa* (Jones), *clavata* nov., *menevensis* nov., *paulsgrovensis* nov., *ventrosa* (Jones).
    3. Genus MORININA, nov.
        Species : *dorsispinata* nov., *roemeri* nov.
    4. Genus LANGTONIA, nov.
        Species : *dolabrata* nov., *setina* nov.
    5. Genus CYAMOCYPRIS, nov.
        Species : *austeni* (Jones), *tumescens* nov., *valdensis* (J. de C. Sowerby).
- *b.* Subfamily CYPRINÆ Dana.
    1. Genus CANDONA Baird.
        Species : *ansata* Jones, *bononiensis* Jones, *mantelli* Jones, *pellucida* nov., *phillipsiana* Jones.
    2. Genus CYPRIS Müller.
        Species : *cornigera* Jones, *henfieldensis* nov., *purbeckensis* Forbes.
    3. Genus CYPRIONE Jones.
        Species : *bristovii* Jones.
    4. Genus DARWINULA Brady & Robertson.
        Species : *leguminella* (Forbes).

II. Family CYTHERIDÆ Zenker.
  a. Subfamily CYTHERINÆ Dana.
    1. Genus CYTHERE Müller.
      Species : *retirugata* Jones, *transiens* Jones.
    2. Genus METACYPRIS Brady.
      Species : *fittoni* (Mantell), *forbesii* (Jones).

Family **Cypridæ** Zenker (1854).

Minute, mostly reniform or elongate-ovate, corneous or corneo-calcareous shells, with thin, somewhat unequal valves, one overlapping the other either ventrally or dorsally or both.

Recent Cypridæ are mostly freshwater inhabitants, but probably all the Palæozoic representatives were marine. The Mesozoic forms seem to have all lived in an estuarine or brackish-water habitat.

Subfamily *ROSTROCYPRINÆ*, nov.

Cypridæ characterised by an antero-ventral beak and notch.

Most of the members of this family have been previously described under the genus *Cypridea* Bosquet. An examination of the articulation of such forms at once indicates the presence of two major subdivisions, viz., one in which the left valve is the larger, and another in which the right valve is the larger, a character which appears to be absolutely constant. A study of the remaining shell characters such as thickness, size, ornament, antero-ventral and postero-ventral flanges, and outline, allows of further subdivision.

The genus *Cypridea* as defined by Bosquet (1852, p. 47) and not by Jones (1885, p. 336) is, therefore, regarded as a group of subfamily rank and is here designated subfamily Rostrocyprinæ, of which the diagnostic feature is the possession of an antero-ventral beak and notch.

DESCRIPTION OF GENERA AND SPECIES.

Genus CYPRIDEA Jones 1885 emend.

Cypris auctorum.
Cypridea Bosquet (pars), 1852, Mem. couron. Acad. Roy. Belg. vol. xxiv. p. 47.
Cypridea (subgenus of *Cypris*) Jones, Morris's Catal. Brit. Foss. 1854, p. 104.
Cypridea (? subgenus of *Cypris*) Jones, Monogr. Brit. Tert. Entom. 1856, pp. 9, 10.

Cypridea Jones, Monogr. Foss. Esth. 1862, p. 106, and Appendix, p. 127.
Cypridea Huxley & Etherigde, Catal. Coll. Foss. Mus. Pract. Geol. 1865, p. 254.
Cypridea H. Woodward, Catal. Brit. Foss. Crustacea, 1877, p. 88.
Cypridea Jones, Geol. Mag. dec. 2, vol. v. 1878, pp. 107, etc.
Cypridea Jones, Quart. Journ. Geol. Soc. vol. xli. p. 336, 1885.
Cypridea Brady, Proc. Zool. Soc. Lond. 1886, p. 90.
Cypridea Brady, Journ. Linn. Soc. vol. xix. 1886, pp. 200, 201.
Cypridea Jones, Geol. Mag. dec. 3, vol. iv. p. 385, 1887.
Cypridea Jones, Geol. Mag. dec. 3, vol. v. 1888, p. 536.

Diagnosis.—Valves obovate or ovate-oblong. Evenly and moderately convex. Usually widest in anterior half. Carapace fairly thick and strong. Surface punctate or reticulate, may be ornamented with large hemispherical bosses, rounded tubercles or spines, which are always arranged on a definite plan. Left valve larger than right, marked overlap on all margins but especially ventrally. Hinge-line simple, straight, knurled anteriorly and flexed to the right posteriorly.

Genotype, *C. punctata* (Forbes). Other species: *aculeata* Jones, *adjuncta* Jones, *dunkeri* Jones, *fasciculata* (Forbes), *granulosa* (J. de C. Sowerby), *indigens* nov., *paucigranulata* Jones, *spinigera* (J. de C. Sowerby), *tuberculata* (J. de C. Sowerby), *verrucosa* Jones.

Remarks.—In this genus spines or tubercles, where developed, are always arranged according to a definite plan, which is so constant as to suggest some connection with the internal structure (see fig. B). The spines or tubercles may be graded into large, medium, and small, and when the ornament is reduced the small tubercles disappear first, followed by the medium-sized ones. Further, it is clear that the large tubercles are not all of the same importance, for when they are reduced in number, five or six of them, always in the same position, tend to remain.

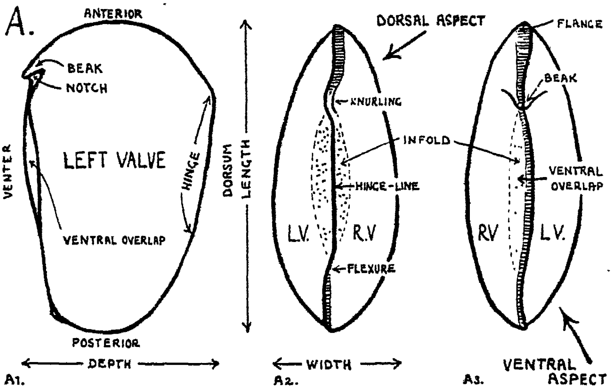
The arrangement of the hinge in *Cypridea* is much like that found in *Cythere* and *Cytherideis*.

The genus *Cypridea* was established by Bosquet (1852, p. 47) for upper Jurassic species previously referred to *Cypris*, which possessed an antero-ventral beak and notch. Beyond noting this characteristic feature Bosquet gave no generic description, and the genus was therefore described by T. R. Jones (1885, p. 336). It is on this description that the above emendation is based.

Since no genotype has been previously designated, *Cypridea punctata* (Forbes) is now selected as typical of the genus as here emended.

Jones states that in this genus the *left* valve is the larger—thus such species as *bispinosa* and *ventrosa* are excluded and are here referred to the new genus *Ulwellia* (p. 300).

In all the descriptions given below the *length* of a carapace is measured along the long axis from anterior to posterior, the *depth* is measured along the short axis from the dorsal margin to the ventral margin, and the *width* is the distance apart of the middle points of the right and left valves when they are opposed as in life. The word *thickness* always refers to the actual shell substance (see fig. A).

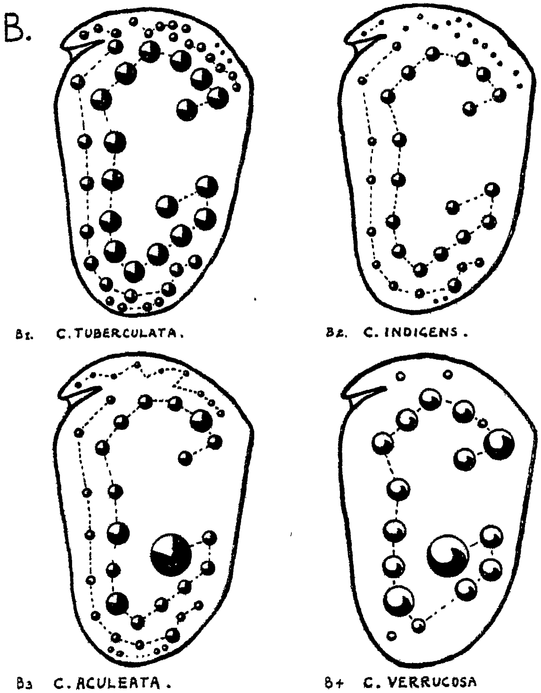


Diagrams illustrating the terms used in the description of Ostracoda of the subfamily Rostrocypridæ. A_1. Outline of a carapace seen from the left side with the anterior end upwards. A_2. Outline of a carapace as seen from the dorsal aspect. The concave area adjacent to the hinge-line is dotted. The thin, semi-transparent flange which, except on the venter, approximately represents the amount of overlap in the larger valve is shaded with horizontal lines. A_3. Outline of a carapace as seen from the ventral aspect. That part of the venter of the larger valve which is folded over the smaller valve is dotted. The flange of the larger valve is shaded with horizontal lines.

L.V. = Left valve. R.V. = Right valve.

The carapaces are invariably figured with the anterior end upwards, a practice depreciated by some American authors but which I consider as a convention less liable to cause confusion than any other.

In the genus *Cypridea* the general proportions of the carapace are length : depth : width : : 100 : 60 : 45.



Diagrams illustrating the ornament pattern in the genus *Cypridea*. B_1. *Cypridea tuberculata.* The ornament consists of blunt spines arranged in concentric rings, the largest spines being in the inner ring. The mid-dorsal segment of the valve is always without ornament. B_2. *Cypridea indigens.* Ornament as in *C. tuberculata,* but the spines are much smaller. B_3. *Cypridea aculeata.* Ornament characterized by the dominance of a large subcentral spine. B_4. *Cypridea verrucosa.* Ornament consisting of large hemispherical bosses, which, though fewer in number than the spines of *C. tuberculata,* are arranged on the same plan.

1. *Cypridea aculeata* Jones.
(Pl. XIII. figs. 3, 10 *a*, 10 *b*.)

Cypridea verrucosa (pars) Jones, Geol. Mag. vol. v. dec. 2, 1878, p. 108, pl. iii. figs. 5, 7 *a*, 7 *b*.
Cypridea aculeata Jones, Quart. Journ. Geol. Soc. vol. xli. 1885, p. 320.

Description.—Valves ovate-oblong. Surface reticulate, ornamented with many small blunt spines and with one large, dominant, sub-central spine in each valve.

Beak and notch fairly well marked. Hinge-line knurled anteriorly and flexed to right posteriorly. A thin flange developed on left valve which overlaps right valve anteriorly, posteriorly, and ventrally.

Figured specimen.—No. 6075 *. Complete carapace.

Dimensions.—No. 60675, length 0·95 mm., depth 9·56 mm., width 0·42 mm. (excluding spines); length of large spine, up to 0·08 mm.

Horizon and locality.—Wealden; No. 1 Well, Henfield, Sussex; at a depth of 905 to 915 ft.

This form is fairly common throughout the Wealden, but is not always typically developed; the spines are often considerably reduced in size and number.

The species was founded on two individuals from the Shotover Ironstones. Jones had previously described and figured these together with two other quite distinct forms as *Cypridea verrucosa* (1878, p. 108, pl. 3), but in his account of the Purbeck Ostracoda in 1885 he revised the previous identifications and referred one (fig. 6) to *C. granulosa*, suggested the name *aculeata* for two others (figs. 5 & 7), and retained the fourth as the type of *C. verrucosa* (fig. 4). Though Jones's figures are very poor there can be no doubt as to the form intended. The large spine in the posterior third of the valve as shown in his pl. iii. figs. 7 *a* & 7 *b* is quite characteristic. In *C. aculeata* the ornament plan is the same as that of *C. tuberculata* and *C. indigens*, to both of which it is closely related; but, with the exception of the subcentral one, the spines are smaller and fewer than in *C. tuberculata* and the carapace is larger and proportionately narrower. The conspicuous large tubercle distinguishes this form from *C. indigens.*

2. *Cypridea indigens* †, sp. n. (Pl. XII. fig. 2; Pl. XIII. figs. 13 *a*, 13 *b*.)

Description.—Valves ovate-oblong. Surface reticulate, ornamented with numerous small blunted spines. Hinge-line knurled anteriorly, flexed to right and slightly knurled posteriorly (Pl. XIII. fig. 13 *a*).

Holotype.—No. 60670. Complete carapace.

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* Type and figured specimens have been deposited in the Geological Survey Museum, London.

† Lat. *indigens*=a pauper.

Dimensions of holotype.—Length 0·82 mm., depth 0·52 mm., width 0·30 mm. (excluding spines); length of spines up to 0·05 mm.

Horizon and locality.—Wealden, No. 1 Well, Henfield, Sussex; at a depth of 820 to 825 ft.

Remarks.—In this species the spines are smaller and fewer than in *C. tuberculata*, especially in the anterior and ventral areas. The large postero-central spine of *C. aculeata* is in *C. indigens* no larger than the others. The valves are slightly more ovate than those of *C. tuberculata* and more finely reticulate, and the antero-ventral beak and notch are more conspicuous. *C. indigens* ranges throughout the Wealden, but the most typical forms are found towards the base; in higher beds the spines are often reduced in size and to three or four in number.

3. *Cypridea tuberculata* (J. de C. Sowerby).
(Pl. XII. figs. 1 *a*, 1 *b*; Pl. XIII. figs. 11 *a*, 11 *b*.)

Cypris tuberculata J. de C. Sowerby, Trans. Geol. Soc. ser. 2, vol. iv. 1836, pp. 177, 205, 228, 345, 352, pl. xxi. fig. 2 *c* (not figs. 2 *a*, 2 *b*).
Cypris tuberculata Lyell, Elements of Geology, 1838, p. 348, fig. 186; 2nd edit. 1841, vol. i. p. 417, fig. 202; Manual of Elementary Geology, 3rd edit. 1851; 4th edit. 1852; 5th edit. 1855, p. 294, fig. 334 *b*; 6th edit. 1865, p. 378, fig. 368 *b*.
Cypris tuberculata Roemer, Verst. nordd. Ool. 1839, p. 52, pl. xx. fig. 23.
Cypris tuberculata Mantell, Medals of Creation, 1st edit. 1844, vol. ii. p. 545, lign. 1819, figs. 3, 3 *a*; 2nd edit. 1854, vol. ii. p. 527, lign. 174, figs. 3, 3 *a* (not fig. 2).
Cypris tuberculata ? Dunker, Monogr. nordd. Weald. 1846, p. 60, pl. xiii. fig. 30.
Cypris spinosa Forbes, MS. July 18, 1851.
Cypris tuberculata ? Forbes, MS. July 23, 1854.
Cypridea tuberculata Morris, Catal. Brit. Foss. 2nd edit. 1854, p. 104.
Cypridea tuberculata H. Woodward, Catal. Brit. Foss. Crust. 1877, p. 89.
Cypridea tuberculata Jones, Quart. Journ. Geol. Soc. vol. xli. 1885, p. 342 (not pl. viii. figs. 22–24).

Description.—Valves ovate-oblong. Surface coarsely reticulate, ornamented with many large blunt spines. Beak and notch small, often obscured by spines. Hinge-line knurled anteriorly, flexed to right posteriorly (Pl. XIII. fig. 11 *a*).

Figured specimens.—Nos. 60667, 60668, both complete carapaces.

Dimensions.—No. 60667. Length 0·87 mm., depth 0·57 mm., width 9·35 mm. (excluding spines).

No. 60668. Length 0·80 mm., depth 0·50 mm., width 0·32 mm. (excluding spines); length of spines, up to 0·08 mm.

Horizon and locality.—Wealden, No. 1 Well, Henfield, Sussex; at a depth of 820 to 825 ft. (both specimens).

Remarks.—This species is especially characteristic of the Wealden and is often found in great abundance. It is rather shorter and more oblong than the other members of the genus. The large spines, which almost cover the surface of the valves, make this a very conspicuous form.

In Fitton's Memoir Sowerby (1836) described at least two distinct forms under the name *Cypris tuberculata*. Some of these (his pl. xxi. fig. 2 *a*) were separated off by Mantell as *Cypris fittoni* (1844, p. 545, figs. 2 *c*, pl. xxi.) and were undoubtedly meant for the present species; the general appearance is well shown in the figure except that the spines are actually far more numerous.

Forbes's figures (in Lyell, 1865, fig. 3686), though showing the form of the spines better than Sowerby's, represent the shape very inaccurately. Neither of these authors saw the anterior beak and notch.

Unfortunately I have been unable to find the type-specimen from which Sowerby drew figures 2 *b* & 2 *c*. The specimen reputed to be the type (R. 2479) is in the Geological Society's collection, but is actually the one from which Sowerby drew fig. 2 *a* (upper figure) and is therefore *Metacypris fittoni*.

4. *Cypridea verrucosa* Jones. (Pl. XII. fig. 3; Pl. XIII. figs. 5 *a*, 5 *b*.)

Cypridea verrucosa var. *crassa* Jones, Geol. Mag. dec. 2, vol. v. 1878, p. 108, pl. iii. fig. 4 (not figs. 5, 6, 7).
Cypridea verrucosa Jones, Quart. Journ. Geol. Soc. vol. xli. 1885, p. 320.

Description.—Valves ovate-oblong. Surface finely punctate, ornamented with large hemispherical bosses. Carapace rather swollen ventrally. Hinge-line knurled anteriorly, flexed to right posteriorly. Small overlapping fringes on anterior and posterior margins (Pl. XIII. fig. 5*a*).

Figured specimen.—No. 60681. Complete carapace.

Dimensions.—No. 60681. Length 1·05 mm., depth 0·68 mm., width 0·50 mm. (excluding bosses); height of bosses up to 0·07 mm.

Horizon and locality.—Upper Purbeck; No. 1 Well, Paulsgrove, Portsdown, Hampshire; at a depth of 2250 to 2255 ft.

Remarks.—A somewhat rare form in the Upper Purbeck and lower part of the Wealden beds. The name *C. verrucosa* was given by T. R. Jones in 1878 to four specimens from the Shotover Ironstone. One of these, a partly embedded and broken left valve (fig. 4, pl. iii.), was described as variety *crassa*. In 1885 three of the individuals previously figured under this name were transferred by Jones to other species (see above, p. 297), and fig. 4 was declared to be the type of *C. verrucosa*. I have in my collection several well-preserved examples of this species in which the shape and ornament can be more easily discerned than in the type-specimen, which is incomplete. One of these is figured on Pl. XII.

2. Genus ULWELLIA *, nov.

Diagnosis.—Valves obovate or ovate-oblong. Antero-dorsal margin slightly concave. Postero-ventral angle of right valve reflexed. Carapace of medium thickness, evenly convex, widest in middle or in posterior half of shell. Surface smooth, punctate or reticulate, may be ornamented with spines or ridges. Right valve larger than left, over lapping it onall margins especially ventrally. Hinge-line knurled anteriorly and posteriorly. Beak and notch often very strongly marked.

Genotype, *U. menevensis* nov. Other species: *bispinosa* (Jones), *clavata* nov., *paulsgrovensis* nov., *ventrosa* (Jones).

The general proportions of the carapace are length : depth : width : : 100 : 63 : 45.

Remarks.—This genus has been created for those species of the Rostrocypridæ in which the right valve is the larger. It is considered that this feature, like shape and hingement, is a character of generic importance, whereas sculpture and ornament are specific characters.

1. *Ulwellia clavata* †, sp. n. (Pl. XIII. figs. 1, 9 *a*, 9 *b*.)

Description.—Valves ovate-oblong. Surface reticulate, ornamented with blunt conical and rounded tubercles of various sizes, as follows:—one large dominant sub-central conical tubercle, usually four other strong rounded bosses or blunt tubercles two ventral and two dorsal, and several other smaller rounded or conical tubercles scattered over the shell. Beak and notch large and very clearly marked. Hinge-line knurled anteriorly and posteriorly with a subcentral flexure to the right.

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* Named after the village of Ulwell in Dorset.

† Lat. *clavus* = a nail or spike.

Holotype.—No. 60666. Complete carapace.

Dimensions of holotype.—Length 0·90 mm., depth 0·55 mm., width 0·36 mm. (excluding tubercles); length of subcentral tubercle up to 0·09 mm.

Horizon and locality.—Wealden; No. 1 Well, Henfield, Sussex; at a depth of 820 to 825 ft.

Remarks.—A not uncommon form in some beds of the Wealden, superficially like *Cypridea aculeata* but easily distinguished from that species by the type and arrangement of the tubercles and by the left valve being the smaller.

2. *Ulwellia menevensis* *, sp. n.

(Pl. XIII. figs. 2 *a*, 2 *b*, 6 *a*, 6 *b*.)

Description.—Valves ovate-oblong. Surface covered with small circular punctations. Beak and notch distinct. Hinge-line slightly curved and strongly knurled anteriorly.

Holotype and Genotype.—No. 60665. Complete carapace.

Dimensions of holotype.—Length 0·96 mm., depth 0·59 mm., width 0·45 mm.

Horizon and locality.—Wealden; No. 1 Well, Henfield, Sussex; at a depth of 810 to 820 ft.

Remarks.—This species, which is very common in the lower part of the Wealden, closely resembles the young of *Cyamocypnis valdensis*, and has probably often been mistaken for it. It is, however, much smaller and thicker shelled and the right valve is the larger. *U. menevensis* also bears a superficial resemblance to *Cypridea punctata*, but is a much more delicate shell, and the punctations are finer.

3. *Ulwellia paulsgrovensis* †, sp. n.

(Pl. XII. figs. 6 *a*, 6 *b*; Pl. XIII. figs. 8 *a*, 8 *b*.)

Description.—Valves triangular-ovate. Surface smooth and glossy. Internal surface of valves bearing minute circular pits. Carapace probably setose in life. Beak and notch very well marked. Hinge-line knurled anteriorly and posteriorly.

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* *Menevia*=Swanage (Saxon Chronicle).

† After Paulsgrove, Portsdown, near Portsmouth.

Syntypes.—Nos. 60676, 60677. Complete carapaces.

Dimensions of syntypes.—No. 60676. Length 0·80 mm., depth 0·51 mm., width 0·36 mm.

No. 60677. Length 0·83 mm., width 0·54 mm., depth 0·38 mm.

Horizon and locality.—Wealden; No. 1 Well, Paulsgrove, Portsdown, Hampshire; at a depth of 2183 to 2185 ft.

Remarks.—*C. paulsgrovensis* is a not uncommon species in the lowest beds of the Wealden and in the uppermost Purbeck. It is very similar to *Cypris lævigata* Dunker (1846, pl. xiii. fig. 25) from the Wealden-schiefer of Obernkirchen, a form which, though differing in detail, has the general shape of the present species. Evidently the shell figured by Dunker was partly embedded in the matrix, which has somewhat obscured the dorsal margin. His description, however, "*Cypris valvulis oblongis, subreniformis, antici-subrostris, lævibus*," is applicable to *Langtonia setina* rather than to the present species.

The young of this species are very like those of *U. menevensis*, and the two are easily confused, because the distinctive punctations of the latter species are often very difficult to see in juvenile specimens.

U. paulsgrovensis is easily distinguished from the other smooth forms *L. setina* and *L. dolabrata* by its outline and by the right valve being the larger.

3. Genus MORININA *, nov.

Diagnosis.—Valves obovate. Surface smooth and glossy, with small widely spaced circular punctations or shallow reticulations. Inner surface of shell with conical pits, from apex of which a minute thread-like pore communicates with the punctæ on the outer surface; apparently setose in life. Carapace thick, strongly convex, widest about middle of shell. Usually ornamented with one or more spines. A transverse groove in each valve runs from the middle of the dorsal margin towards the centre. Left valve larger than right, overlapping it on all margins, especially ventrally. Hinge-line knurled anteriorly and posteriorly, and the right valve carries a narrow longitudinal ridge parallel to the hinge and close to it.

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* *Morini*, a tribe once living in Dorset (Ptolemy).

General proportions of carapace: length : depth : width : : 100 : 60 : 50.

Genotype, *M. dorsispinata* nov. Other species, *M. roemeri* nov.

Remarks.—The surface sculpture and the tumid, almost cylindrical carapace of shells belonging to this genus distinguish them without any possibility of confusion from all other Wealden and Purbeck Ostracoda.

1. *Morinina dorsispinata*, sp. n.
(Pl. XII. figs. 4 *a*, 4 *b*, 11 *a*, 11 *b*.)

Cypridea dorsispinata Jones, Quart. Journ. Geol. Soc. vol. xli. 1885, p. 335 (MS. name only).

Description.—Valves obovate. Surface smooth, glossy, with small circular punctations and ornamented with two sharp spines placed one antero-dorsally and one postero-dorsally. Beak and notch well marked in left valve.

Holotype.—No. 60686. Complete carapace.

Dimensions of holotype.—Length 0·83 mm., depth 0·50 mm., width 0·43 mm. (excluding spines); length of spines up to 0·05 mm.

Horizon and locality.—Wealden; No. 1 Well, Henfield, Sussex; at a depth of 95 to 100 ft.

Remarks.—*M. dorsispinata* is very common in the upper part of the Wealden. It was first recorded by T. R. Jones under an MS. name in his list of Wealden species published in 1885, but was not then or subsequently described or figured. There is no doubt, however, about the form he intended to bear this name, for there are several specimens so labelled in his handwriting in the Geological Survey Museum, London. I have, therefore, adopted the name proposed by Jones for this species.

2. *Morinina roemeri* *, sp. n.
(Pl. XII. figs. 5 *a*, 5 *b*.)

Description.—Valves obovate. Surface smooth, glossy, with small circular punctations and ornamented with a sharp postero-dorsal spine.

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* In honour of F. A. Roemer.

Syntypes.—Nos. 60671, 60672. Complete carapaces.

Dimensions of syntypes.—No. 60671. Length 0·85 mm., depth 0·52 mm., width 0·43 mm. (excluding spine).

No. 60672. Length 0·90 mm., depth 0·55 mm., width 0·45 mm. (excluding spine).

Horizon and locality.—No. 60671, Wealden; No. 1 Well, Henfield, Sussex; at a depth of 875 to 880 ft.

No. 60672. Wealden; No. 1 Well, Henfield, Sussex; at a depth of 885 to 890 ft.

This species is as abundant and has much the same range as *M. dorsispinata*, to which it is closely related.

4. Genus LANGTONIA *, nov.

Diagnosis.—Valves ovate or triangular-ovate. Surface smooth and glossy. Beak and notch usually small. Hinge-line simple, curved. Valves not very thick, moderately convex, slightly compressed anteriorly and dorsally. Greatest width near ventral margin. Left valve larger than right, overlap most on ventral margin.

Genotype, *L. setina* nov. Other species: *L. dolabrata* nov.

1. *Langtonia dolabrata* †, sp. n. (Pl. XII. figs. 8 *a*, 8 *b*; Pl. XIII. figs. 14 *a*, 14 *b*.)

Description.—Valves triangular-ovate, large. Surface smooth, glossy. Beak and notch small. Hinge-line simple, curved, the middle part of the dorsal margin in the right valve is swollen along the length of the hinge, the left valve is swollen along the anterior part of the dorsal margin to about the middle of the hinge.

Holotype.—No. 60680. Complete carapace.

Dimensions of holotype.—Length 1·05 mm., depth 0·74 mm., width 0·48 mm.

Horizon and locality.—Upper Purbeck; No. 1 Well, Paulsgrove, Portsdown, Hampshire; at a depth of 2250 to 2255 ft.

This large smooth form is easily recognized by its shape, rather like a polished stone axe. It is found, not very abundantly, in the uppermost Purbeck beds.

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* After Langton Matravers, a village in Dorset.

† Lat. *dolabra*=an axe.

2. *Langtonia setina* *, sp. n.

(Pl. XII. figs. 7 *a*, 7 *b* ; Pl. XIII. figs. 12 *a*, 12 *b*.)

Diagnosis.—Valves ovate. Surface smooth and glossy. Beak and notch small. Hinge-line curved, knurled posteriorly. Overlap slight except ventrally.

Syntypes.—Nos. 60682, 60679. Complete carapaces.

Dimensions of syntypes.—No. 60682. Length 0·94 mm., depth 0·54 mm., width 0·42 mm.

No. 60679. Length 0·95 mm., depth 0·60 mm., width 0·43 mm.

Horizon and locality.—Both specimens from the Upper Purbeck; No. 1 Well, Paulsgrove, Portsdown, Hampshire; at a depth of 2250 to 2255 ft. (No. 60682), and 2245 to 2250 ft. (No. 60679).

A very abundant species in the uppermost Purbeck beds. The ovate outline of this form is unusual and makes it easily distinguished from *U. paulsgrovensis* and *L. dolabrata*. *L. setina* is very like Dunker's description of *Cypris laevigata*, and the two forms may be identical (see p. 302).

5. Genus CYAMOCYPRIS †, nov.

Diagnosis.—Valves obovate or ovate-oblong. Surface covered with small shallow punctations. Beak and notch well marked. Carapace large, evenly convex and thin with antero-ventral and postero-ventral fringes on left valve. Hinge-line knurled anteriorly and flexed to right posteriorly. Left valve larger than right overlapping it on all margins, especially ventrally.

Genotype, *C. valdensis* (J. de C. Sowerby). Other species: *C. austeni* (Jones), *C. tumescens* nov.

Remarks.—The forms included in this genus are all very large (for Jurassic species), often being 2 mm. in length. The length of the genotype is given by Sowerby as 1/10 inch. The shell is very thin and fragile, consequently only fragments of the carapace have been extracted from the boring samples. This feature is in marked contrast to the sturdy shells possessed by all the other Wealden-Purbeck genera. The curious antero-ventral and postero-ventral fringes, which attain their greatest development in *Cyamocypris*, are extremely thin extensions of the carapace, transparent and with dark transverse lines or thickenings. On account of their great delicacy these fringes are rarely preserved unbroken.

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* Low Lat. *setinus*=satiny, glossy.

† Greek *kyamos*=a bean.

The genotype (*Cypris valdensis*) was originally referred by Sowerby to *Cypris faba* Desmarest (Min. Conch. pl. cccclxxxv. 1824), but in Fritton's memoir "On the Strata below the Chalk" (J. de C. Sowerby, 1836, pp. 177 & 344), the name was changed to *Cypris valdensis*.

1. *Cyamocypris tumescens* [*], sp. n.
(Pl. XIII. figs. 4 *a*, 4 *b*, 7 *a*, 7 *b*.)

Description.—Valves ovate. Surface finely punctate. A strong beak in the left valve continuing into a marked anterior swelling. Dorsal margin slightly swollen at anterior and posterior ends of hinge-line. Posterior of left valve strongly swollen. Right valve much smaller than left and without the swellings or fringes. Valves evenly convex and very thin.

Holotype.—No. 60687. Complete carapace [†].

Dimension of holotype.—Length 1·39 mm., depth 0·79 mm., width 0·53 mm.

Horizon and locality.—Chert Bed, Middle Purbeck; 400 yds. S.E. of Friar Waddon, Upwey, Dorset.

Remarks.—This species is quite distinctive. All the specimens from this locality are preserved in silica, so that the fine details of the delicate fringes are clearly visible. The right valve of *C. tumescens* is so different from the left that if found detached it might quite easily be mistaken for another species.

b. Subfamily *Cyprinæ* Dana.

1. Genus Candona Baird.

Wealden and Purbeck species: *ansata* Jones, *bononiensis* Jones, *mantelli* Jones, *pellucida* nov., *phillipsiana* Jones.

Candona pellucida [‡], sp. n. (Pl. XII. figs. 10 *a*, 10 *b*.)

Description.—Valves suboblong, convex, widest in middle. Surface smooth and glossy. Inner surface of valves with minute scattered circular pits. Probably setose in life. Left valve larger than right, overlapping it on all margins, especially ventrally. A narrow flange, marked anteriorly with dark radial lines and small papillæ, borders the left valve. Lucid spots, subcircular, coalesced, a central transverse row of four.

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[*] Lat. *tumeo*=to be swollen.

[†] From material collected by Mr. J. A. Robbie of H.M. Geological Survey.

[‡] Lat. *pellucidus*=transparent.

Syntypes.—Nos. 60673, 60674. Complete carapaces.

Dimensions of syntypes.—No. 60673. Length 0·86 mm., depth 0·50 mm., width 0·46 mm.

No. 60674. Length 0·94 mm., depth 0·62 mm., width 0·47 mm.

Horizon and locality.—Wealden ; No. 1 Well, Henfield, Sussex ; at depths of 900 to 905 ft. (No. 60673), and 905 to 915 ft. (No. 60674).

Remarks.—This shell is very like a variety of *Candona ansata* figured by Jones (1885, pl. ix. fig. 10), but the postero-ventral angle is more acute than in that species, the flange is more conspicuous, and the valves are more tumid. *C. pellucida* differs considerably from the varieties of *C. ansata* (Jones, 1885, pl. ix. figs. 9 & 12) which have a strongly projecting postero-ventral angle.

2. Genus Cypris Müller.

Wealden and Purbeck species: *cornigera* Jones, *henfieldensis* nov., *purbeckensis* Forbes.

Cypris henfieldensis *, sp. n.
(Pl. XII. figs. 9 *a*, 9 *b*.)

Description.—Valves subreniform. Shell thin. Surface smooth and glossy. Lucid spots large, subcircular, coalesced, a central transverse row of four. Carapace widest and deepest in anterior half. Valves evenly convex. Dorsal margin slightly flattened. Left valve larger than right, with very little overlap except ventrally.

Holotype.—No. 60683. Complete carapace.

Dimensions of holotype.—Length 0·80 mm., depth 0·46 mm., width 0·33 mm.

Horison and locality.—Wealden ; No. 1 Well, Henfield, Sussex ; at a depth of 50 to 55 ft.

Remarks.—*C. henfieldensis* is very similar to some varieties of *Cypris purbeckensis* Forbes, particularly those figured by Jones (1885, pl. ix. figs. 3 & 5). It is, however, smaller and more delicate than that species and the dorsal margin is flattened along the length of the hinge instead of being uniformly rounded.

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* After the village of Henfield, in Sussex.

C. henfieldensis is common in some beds of the Wealden.

SUMMARY.

In the foregoing account of the Wealden and Purbeck Ostracoda the classification of these fossils is revised and several new species are described.

The genus *Cypridea* Bosquet is regarded as a new subfamily, Rostrocyprinæ, and the new genera *Ulwellia*, *Morinina*, *Langtonia*, and *Cyamocypris* are proposed.

Details of the variation and distribution of species are left for a further communication.

The author wishes to thank Mr. C. P. Chatwin for his careful scutiny and valuable criticism of this paper.

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EXPLANATION OF THE PLATES.

PLATE XII.

Fig. 1. *Cypridea tuberculata* (J. de C. Sowerby), p. 298. *a*, right valve (60668): Wealden, Henfield. *b*, left valve (60667): Wealden, Henfield.

Fig. 2. *Cypridea indigens*, sp. n. Holotype, p. 297, right valve (60670). Wealden, Henfield.

Fig. 3. *Cypridea verrucosa* Jones, p. 299, left valve (60681): Upper Purbeck, Paulsgrove.

Fig. 4. *Morinina dorsispinata*, sp. n. Holotype, p. 303. *a*, right valve (60686): Wealden, Henfield. *b*, left valve (60686): Wealden, Henfield.

Fig. 5. *Morinina roemeri*, sp. n. Syntypes, p. 303. *a*, right valve (60672): Wealden, Henfield. *b*, left valve (60671): Wealden Henfield.

Fig. 6. *Ulwellia paulsgrovensis*, sp. n. Syntypes, p. 301. *a*, right valve (60677): Wealden, Paulsgrove. *b*, left valve (60676): Wealden, Paulsgrove.

Fig. 7. *Langtonia setina*, sp. n. Syntypes, p. 305. *a*, right valve (60682): Upper Purbeck, Paulsgrove. *b*, left valve (60679): Upper Purbeck, Paulsgrove.

Fig. 8. *Langtonia dolabrata*, sp. n. Holotype, p. 304. *a*, right valve (60680): Upper Purbeck, Paulsgrove. *b*, left valve (60680): Upper Purbeck, Paulsgrove.

Fig. 9. *Cypris henfieldensis*, sp. n. Holotype, p. 307. *a*, right valve (60683): Wealden, Henfield. *b*, left valve (60683): Wealden, Henfield.

Fig. 10. *Candona pellucida*, sp. n. Syntypes, p. 306. *a*, right valve (60673): Wealden, Henfield. *b*, left valve (60674): Wealden, Henfield.

Fig. 11. *Morinina dorsispinata*, sp. n., p. 303. *a*, dorsal aspect (60684): Wealden, Henfield. *b*, ventral aspect (60685): Wealden, Henfield.

The specimens are figured with the anterior end upwards. The magnification in all cases is about 30×. The exact dimensions of each individual are quoted in the text.

PLATE XIII.

Fig. 1. *Ulwellia clavata*, sp. n. Holotype, p. 300, right valve (60666): Wealden, Henfield.
Fig. 2. *Ulwellia menevensis*, sp. n. Holotype, p. 301. *a*, right valve (60665): Wealden, Henfield. *b*, left valve (60665): Wealden, Henfield.
Fig. 3. *Cypridea aculeata* Jones, p. 296, left valve (60675): Wealden, Henfield.
Fig. 4. *Cyamocypris tumescens*, sp. n. Holotype, p. 306. *a*, right valve (60687): Middle Purbeck, Upwey. *b*, left valve (60687): Middle Purbeck, Upwey.
Fig. 5. *Cypridea verrucosa* Jones, p. 299. *a*, dorsal aspect (60681): Upper Purbeck, Paulsgrove. *b*, ventral aspect (60681): Upper Purbeck, Paulsgrove.
Fig. 6. *Ulwellia menevensis*, sp. n., p. 301. *a*, dorsal aspect (60665): Wealden, Henfield. *b*, ventral aspect (60665): Wealden, Henfield.
Fig. 7. *Cyamocypris tumescens*, sp. n., p. 306. *a*, dorsal aspect (60687): Middle Purbeck, Upwey. *b*, ventral aspect (60687): Middle Purbeck, Upwey.
Fig. 8. *Ulwellia paulsgrovensis*, sp. n., p. 301. *a*, dorsal aspect (60677): Wealden, Paulsgrove. *b*, ventral aspect (60677): Wealden, Paulsgrove.
Fig. 9. *Ulwellia clavata*, sp. n., p. 300. *a*, dorsal aspect (60666): Wealden, Henfield. *b*, ventral aspect (60666): Wealden, Henfield.
Fig. 10. *Cypridea aculeata* Jones, p. 296. *a*, dorsal aspect (60675): Wealden, Henfield. *b*, ventral aspect (60675): Wealden, Henfield.
Fig. 11. *Cypridea tuberculata* (J. de C. Sowerby), p. 298. *a*, dorsal aspect (60668): Wealden, Henfield. *b*, ventral aspect (60668): Wealden, Henfield.
Fig. 12. *Langtonia setina*, sp. n., p. 305. *a*, dorsal aspect (60678): Upper Purbeck, Paulsgrove. *b*, ventral aspect (60678): Upper Purbeck, Paulsgrove.
Fig. 13. *Cypridea indigens*, sp. n., p. 297. *a*, dorsal aspect (60669): Wealden, Henfield. *b*, ventral aspect (60669): Wealden, Henfield.
Fig. 14. *Langtonia dolabrata*, sp. n., p. 304. *a*, dorsal aspect (60680): Upper Purbeck, Paulsgrove. *b*, ventral aspect (60680): Upper Purbeck, Paulsgrove.

The specimens are figured with the anterior end upwards. The magnification in all cases is about 30×. The exact dimensions of each individual are quoted in the text.

XXXVI.—*Some Remarks upon Non-Peneid Crustacea Decapoda.* By MARTIN D. BURKENROAD, Bingham Oceanographic Laboratory, Yale University.

A STUDY of the Caridean prawn *Rhynchocinetes rigens* Gordon (material for which was obtained during visits to the Bermuda Biological Station in 1935 and 1936) suggests that, in contradiction of the customary view, the family Rhynchocinetidæ is more nearly related to the Hoplophoridæ than to the Palæmonidæ; and that the corresponding superfamilies may with advantage be re-defined. The same study has led to discovery that in branchial pattern the tribe Caridea resembles the Stenopidea and differs from the Penæidea and Reptantia. The discussion of these matters is introduced by a description of the natural history of the prawn.

I should like to offer my thanks to Dr. I. Gordon for aid in identification of the prawn; to Dr. F. A. Chace, Jr., for material and for discussion; to Dr. W. Beebe for planktonic larvæ; to Dr. R. Gurney for criticism; and to Dr. J. G. F. Wheeler for his many kindnesses during my stay in Bermuda.

I. *Rhynchocinetes rigens*, described from Madeira by Gordon, 1936, is the only known Atlantic representative of its family. It has not been previously recorded from Bermuda, where it occurs as a sedentary, nocturnal, littoral form discovered by the brilliant red reflection of its eyes in the beam of a head-light. Adults were observed only in two localities of small extent (near the lime-kiln at the entrance to Mullet Bay, and as discovered by Mr. W. Gleeson, on the west point of Richardson's Inlet, St. Georges) at which artificial piles of boulders at the water's edge extend to somewhat below the level of the lowest tides. The animal comes out from submerged crevices between these rocks at nightfall without apparent reference to moon or tide (although the difficulty of finding it naturally varies with these factors) and seems to remain at the surface until day. It retreats easily into the crevices when slightly disturbed or darts with some precision and agility when pressed; in consequence, while easy to approach with a light, it is very difficult to capture. Its movements at the surface of the rock-heaps seem to be of limited scope; and it appears to migrate vertically or horizontally within the crevices with rise and fall of the tide, rather than to move with the sea up or down the face of the rockery. Its emergence from the crevices is of unknown significance, since under the conditions of observation it was not noticed to do anything at the surface but to sit quietly (or to retreat), but may have a nutritional end. The animal is perhaps gregarious since considerable groups are seen together, which when disturbed enter the same cavern; between these gatherings lie stretches of rockery inhabited only by *Brachycarpus* and *Lysmata*. It seems to be a browser, since its fecal pellets contained only sponge spicules, algal remnants and occasional bits of mulluscan shell, and since it did not enter traps baited with fish in which numbers of *Brachycarpus* and *Lysmata* were captured. An individual confined in an aquarium fed freely upon *Ulva*. The examples taken from traps at Madeira (Gordon, 1936) may perhaps have been seeking shelter rather than bait.

The colour in life of adults is, mottled red and white in an individually variable pattern more or less correspondent with that figured by Gordon; ovary and newly laid eggs are apple-green.

Berried females were taken during all the months of search, January through June. The larvæ were hatched and maintained in aquaria to the second stage in 1936. They seemed positively phototropic; their geotropism seemed to change from positive to negative with increase in intensity of illumination; and they appeared to be positively thigmotropic since they usually hung with ventral or dorsal surface to the sides of the rearing jars. They showed little response to particles of fish, worm, mollusc, or sponge, but when fine washings from littoral boulders were added to the rearing jars their gut rapidly filled with unicellular algæ. No early larvæ were obtained other than *in vitro*, except one which was flushed from a deep chamber inhabited by numerous adults. The first stage larvæ, about 2·0 mm. long, very slender, and lacking limbs posterior to the third maxillipedes, have the following coloration:—Eyes bluish-black; distal end of telson with a pair of chromatophores blue with red centre; proximal end of telson with a median chromatophore yellow with red centre flanked at juncture of telson with twentieth somite by a pair of similar pigment-spots. Anterior end of twentieth somite with a pair of large chromatophores bluish-white with red or brown centre. A red and yellow chromatophore dorsal to the gut in each pleonic somite; a large one in the middle of the dorsum of the carapace; a smaller pair behind the eyes; one at base of each antennule, and others of similar tint internally in cephalothorax. The viscera are in some individuals surrounded by bluish pigment.

Larvæ in mysis stages, about 9·0 mm. in length, quite like the adult in many features although with unjointed rostrum, and with exopodites upon the anterior four pereipods, were found in plankton samples which had been taken by Dr. William Beebe (D.T.R., N.Y.Z.S., Nets 1413, 1414, 1428) at the surface in October, 1936, nine miles south of Nonsuch, between 8.0 and 9.0 P.M.

II. The family Rhynchocinetidæ (which comprises only the genus *Rhynchocinetes*) has been regarded as related to the Palæmonidæ, Alpheidæ, and Hippolytidæ, and has generally been included with them in a superfamily Palæmonoida (Balss, 1927). The first-stage larva of *Rhynchocinetes rigens* proves, however, to be reminiscent in general form of the equivalent larvæ of the family Hoplophoridæ (superfamily Hoplophoroida); and in particular its maxillula is provided with the vestige of an exopodite, a feature otherwise recorded among Caridean larvæ only in Hoplophoridæ and the related Atyidæ, and known to be absent in Palæmonidæ, Alpheidæ, and Hippolytidæ (Gurney, 1924 and 1926).

The major features in which adults of all four of the families customarily included in Palæmonoida differ from the family Hoplophoridæ seem to be the following:—The exopod of the first maxillipede is provided with a distal lash in Rhynchocinetidæ, Palæmonidæ, Alpheidæ, and Hippolytidæ; the molar and incisor processes of the mandible are clearly separated (or the incisor is absent); exopodites are absent from all of the pereiopods in adult stages (and from the fifth legs of the larvæ). But in addition to the Hoplophoridæ, the superfamily Hoplophoroida is usually considered to include the five families Atyidæ, Campylonotidæ, Eugonatonotidæ, Disciadidæ, and Nematocarcinidæ. In all of these five families, the exopod of the first maxillipede is provided with a distal lash; while the fourth and fifth families listed have a clearly divided mandible (which in the third lacks an incisor completely), the second and many members of the first family lack pereiopodal exopodites completely as adults [and the fifth family at least lacks them from the fifth legs in larval stages (accepting that *Caricyphus* represents the larva of *Nematocarcinus*)]. In fact, it is possible to arrange an almost perfectly graded series among the six Hoplophoroid families from the extreme with distally articulated dactyl of second maxillipede, unseparated mandibular molar and incisor, and rich series of exopodites and branchiæ, toward what is often termed " Palæmonoid " form. Thus, among the Atyidæ (which are in many respects close to those Hoplophoridæ with laterally articulated dactyl of second maxillipede) the delayed appearance of the exopodite of the fifth leg during development seems to point toward its permanent failure of appearance in *Nematocarcinus* ; and the absence of the exopods of other legs in adult stages of some Atyids is comparable with their complete absence in Campylonotidæ. Similarly, reduction in the number of arthrobranchs and epipodites in Atyidæ may be compared with the absence of epipodites in the Campylonotid *Bathypalæmonella*, and with the still more extensive reduction in *Discias*. The disappearance of teeth from that portion of the mandibular incisor lying between its tip and the molar process in *Atya* seems to exemplify a stage in a reduction of this part of the mandible such as is completed by the separation of incisor and molar in adult *Discias* and *Nematocarcinus* ; and it may be noted that the mandible of the mysis stage in *Nematocarcinus* somewhat resembles that of adult *Atya*. The reduction of the lateral armature of the telson and its shift to the dorsal surface in Atyidæ is extended in *Campylonotus*, and reaches completely Palæmonoid form in *Bathypalæmonella*, *Eugonatonotus*, and *Discias*.

It has been suggested by Kemp, 1920, that *Discias* is indicated by the structure of mandible and maxilla to be more nearly related to Palæmonidæ and Hippolytidæ than to Hoplophoridæ and Atyidæ ; but the strict definition of Hoplophoroida as with indistinctly separated mandibular molar and incisor would require the transfer to the Palæmonoida not only of *Discias*, but of *Nematocarcinus* and of *Eugonatonotus* (a genus until very recently included in the family Hoplophoridæ itself). Such a transfer would hardly diminish the difficulties of superfamilial definition ; since *Eugonatonotus* and *Discias* differ from the forms customarily included in the Palæmonoida by their possession of exopodites upon periopods, including the fifth in adult stages, whereas the members of the latter superfamily even lack them from the fifth legs as larvæ; since *Eugonatonotus* and *Nematocarcinus* are " primitive " in bearing a rich series of epipodites and arthrobranchs and since *Nematocarcinus* bears a numerous lateral armature upon the telson (as in Rhynchocinetidæ and in a few exceptional Hippolytidæ and Pontoniinæ alone of Palæmonoida).

On the other hand, there seems to be no particularly urgent reason for the inclusion of *Rhynchocinetes* in the Palæmonoida, since, as shown above, the members of this genus are matched or exceeded in all of their " Palæmonoid " features by various of the forms usually included in the Hoplophoroida. The transfer of Rhynchocinetidæ to the Hoplophoroida could therefore in no way aggravate the difficulties of differentiation of the two superfamilies under consideration; and it would indeed permit a convenient distinction of a group Palæmonoida from a group Hoplophoroida as follows :—*In those more or less exceptional* Palæmonidæ, Hippolytidæ, *and* Alpheidæ *in which the outer antennular flagellum is not clearly bifurcated, the carpus of the second legs is subdivided; whereas in* Hoplophoridæ, Atyidæ, Eugonatonotidæ, Campylonotidæ, Rhynchocinetidæ, Nematocarcinidæ *and* Disciadidæ *neither the outer antennular flagellum nor the carpus of the second leg is ever divided.*

As to whether the group Hoplophoroida as thus reconstituted would be one naturally as well as conveniently distinguishable from the Palæmonoida, little unequivocal evidence seems to be obtainable from adult structure. It may, however, be worth noting that the species of *Rhynchocinetes* bear a most striking resemblance in general form to those of *Campylonotus* (and especially *R. rigens* Gordon to *C. vagans* Bate), a resemblance which extends even to the unusual form of the first pleopoda in the males (although, as Dr. Gordon has pointed out to me, the two genera may be distinguished at a glance by the somewhat larger size of the first as compared with the second chelipeds in *Rhynchocinetes*, the proportions being reversed in *Campylonotus*; and although there are numerous differences of detail). *Rhynchocinetes* also bears some general resemblance to *Eugonatonotus*, and the latter to some extent approaches both Atyidæ and Disciadidæ in the form of its first chelipeds. The peculiar reduplication of the proximal endite of the maxilla of *Rhynchocinetes* appears also in *Discias* and in *Nematocarcinus*. *Rhynchocinetes*, *Campylonotus*, and *Nematocarcinus* seem to be unique in lacking the curious grapples which terminate the epipodites in all other Caridea in which these are present.

Since the early stages of Eugonatonotidæ, Nematocarcinidæ, Campylonotidæ, and Disciadidæ are at present unknown, it remains for the future to say whether the presence of some vestige of maxillular exopodite in the larva may not distinguish all of the groups here considered to be Hoplophoroida from other Caridea.

III. An examination of mysis stages of *Rhynchocinetes rigens* and other Caridea from the Bermudan plankton reveals that the gills termed pleurobranchs in the adult are present before the arthrobranchs appear. In contrast, a study of the development of the Penæidea (Burkenroad, 1934, p. 118) has shown that in this tribe the arthrobranchs precede the pleurobranchs in time of appearance. According to the descriptions of adult Caridea given by Calman (1909, p. 280), arthrobranchs behind somite viii are, although accompanied by pleurobranchs, always uniserial if present; whereas the attribution of uniserial arthrobranchs to somites posterior to viii in the adult Penæidea *Eusicyonia* and *Sergestes* has been shown by Burkenroad (1934 and 1937) to be incorrect, it being the pleurobranch rather than one of the pair of arthrobranchs which is most likely to be absent in this latter tribe. Careful examination of the gills of adults of *Rhynchocinetes* and other Caridea indicates that those commonly termed pleurobranchs actually do occupy the position anterior to the ventral gill (when this is present) which is distinctive of the structures properly termed pleurobranchs in the Penæidea (and even that the dorsal gill of viii, which has been termed an arthrobranch in some Caridean genera, has always the same relative position as the dorsal gills of succeeding somites). It therefore appears that the Caridea are actually contrasted to the Penæidea as regards the order of appearance and the correlated likelihood of absence of arthrobranchs and pleurobranchs.

Examination of Stenopid larvæ of uncertain parentage seems to indicate that the pleurobranchs appear before the arthrobranchs in this group as in the Caridea; and in agreement with this, the branchial formula for the adult Stenopid *Spongicola inermis* given by A. Milne Edwards and Bouvier (1909, p. 265) differs from the richer one of *Stenopus* in that the arthrobranchs are uniserial in the former species, although a quite complete set of pleurobranchs continues present.

In contrast to the Stenopids, the relation of arthrobranchs to pleurobranchs seems to be somewhat the same among adult Reptantia as in Penæidea. A degree of divergence from this rule is provided by the Reptant group Brachyura, which agrees with other Reptantia in that pleurobranchs are absent from somites ix and x, which may bear single or paired arthrobranchs; but differs from other Reptants in that pleurobranchs may occur upon somites xi and xiii when arthrobranchs are single or absent. From the examination of Axiid larvæ of unknown parentage, it seems possible that in the development of this Reptant group the arthrobranchs appear before the pleurobranchs, although in the development of many Reptants gills of both categories seem to appear simultaneously.

To summarize the foregoing, while a more extensive series of gills may be present in certain Penæidea, Reptantia and Stenopidea than in any Caridea (*cf.* Gurney, 1924, p. 140), the developmental process by which the complement of gills is produced in Stenopidea more nearly resembles that in Caridea than that in Penæidea and in Reptantia. Thus when, by the failure to appear at all of gills normally delayed, a less complete adult formula is produced in Stenopidea: this bears most resemblance to the Caridean formula rather than to that in Reptantia and Penæidea with reduced complement of gills. Stated in most summary fashion, pleurobranchs appear to have precedence over arthrobranchs in Caridea and Stenopidea, while the reverse is in general true of Penæidea and Reptantia.

The significance of this difference of branchial pattern is not immediately apparent, except insofar as it may provide still further evidence against acceptance of the category Natantia.

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XXXVII.—*The Devonian Fish* Chelyophorus *Agassiz*.

By Sir ARTHUR SMITH WOODWARD, F.R.S.

IN 1845, Agassiz[*] noticed among fossils from the Upper Devonian Magnesian Limestone of Orel, Russia, several dermal plates which seemed to belong to an armoured fish like *Pterichthys*, but differed in their external ornament. He referred them to a new genus, *Chelyophorus*, of which the species were much smaller than the known forms of *Pterichthys*. The superficial tubercles were not stellate and irregularly arranged, but were elongated and usually fused into reticulating, sinuous, or straight ridges, with a tendency to radiation from a centre. To distinguish such plates merely by their ornament naturally led to mistakes, especially by subsequent authors; but, as remarked by W. Gross [†], there is no doubt about the relationships of the first two specimens

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[*] L. Agassiz, 'Poiss. Foss. Vieux Grès Rouge' (1844–45), p. 135, pl. xxxi *a*.

[†] W. Gross, Zentralbl. f. Min., etc., 1936, Abt. B, p. 74.

(the types) described by Agassiz (*op. cit.* pl. xxxi *a*, figs. 14, 15), which must be regarded as the median dorsal and the anterior dorso-lateral plates of an Arthrodiran allied to *Ptyctodus*.

This determination is confirmed by the recent discovery in the Middle Old Red Sandstone of Scotland of a small new Ptyctodont, which has been described by Prof. D. M. S. Watson * under the name of *Rhamphodopsis*. The original median dorsal plate of *Chelyophorus verneuilli*, which measures not much more than a centimetre in length, may perhaps be a little abraded round the margin, but it is narrower in front than behind, while its lateral border is produced into an angular extension for the deep overlap of the anterior dorso-lateral plate. It bears the usual median longitudinal ridge on its inner face, and its hinder border is notched and furrowed in the middle to receive a small spine or tubercle. Though differing generically, it is therefore essentially similar to the median dorsal plate of *Rhamphodopsis*. The original anterior dorso-lateral plate of *C. verneuilli* is sufficiently well preserved to show that it is very deep and narrow, with large surfaces of overlap and a triangular exposed area which is ornamented by a radiating reticulation and traversed by a prominent sensory canal extending directly backwards from the articular prominence. This plate, therefore, also agrees essentially with the corresponding plate of *Rhamphodopsis*, only differing in the relatively greater depth of the exposed area. One specimen shown partly enlarged by Agassiz (*op. cit.* pl. xxxi *a*, fig. 18) displays especially well the ornament like that of *Rhamphodopsis*.

In 1857, Pander † described from Orel a more varied series of median dorsal and anterior dorso-lateral plates, which he referred to *Chelyophorus*. The ovoid dorsal plates seem to be abraded round the edge so that their exact shape is uncertain, but one of them (Pander's pl. vii. fig. 10) exhibits a small ornamented tubercle in the hinder median notch and also a median longitudinal cleft extending along the whole length of the plate. A rolled fragment of a similar plate had already been described by Fischer de Waldheim in 1852 *. Pander remarked that this plate seemed to be formed by the fusion of a symmetrical pair, and he pointed out that the median longitudinal keel on the inner face is paired, with a middle space which is partly closed below.

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* D. M. S. Watson "On *Rhamphodopsis*, a Ptyctodont from the Middle Old Red Sandstone of Scotland," Trans. Roy. Soc. Edinb. vol. lix. no. 15 (1938).

† C. H. Pander, 'Die Placodermen des devonischen Systems' (1857), p. 96, pl. vii.

With the ovoid plates from Orel there is another of more usual Arthrodiran shape, but with the same reticulate ornament and a median notch filled by a tubercle behind (Pander, pl. vii. fig. 11 *d*). There seems, therefore, to be more than one form of *Chelyophorus*-like fish, but discoveries of skeletons are needed before the genera and species can be defined. The only imperfect skeleton hitherto found is contained in a nodule from Orel which was described by Eichwald in 1860 †. It is interesting as showing the very strong axial skeleton of the trunk, in which the closely ranged neural arches are deeper than the deepest of the hæmals in the front part of the caudal region. It is also noteworthy because on the back of the caudal region it bears a slender rod which was described by Eichwald as a dorsal spine. Many years ago, when I studied this specimen in the Eichwald collection in the University of St. Petersburg (as it then was), I thought that the supposed spine might be only a fin support crushed and displaced ‡; but its slenderness and length now suggest to me that Eichwald's determination may be correct. There is no other trace of a fin. The anterior armour is unfortunately too much confused and broken to be interpreted; and (as remarked by Gross) the isolated fragment of head referred by Eichwald at the same time to *Chelyophorus* is the imperfect anterior portion of a Crossopterygian skull.

There can, indeed, be no longer any doubt that *Chelyophorus* is a Ptyctodont, and if it really possesses a second dorsal spine, as seems probable, it must be taken into account when discussing the relationship of the Arthrodires to the Acanthodians.

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* G. Fischer de Waldheim, Bull. Soc. Imp. Nat. Moscou, vol. xxv. (1852), pt. i. p. 172, pl. ii. fig. 3.

† E. von Eichwald, 'Lethaea Rossica,' vol. i. (1860), p. 1525, pl. lvii. fig. 3.

‡ A. S. Woodward, 'Catal. Foss. Fishes Brit. Mus.' pt. ii. (1891), p. 299.

XXXVIII.—*On a Collection of Polychæta, chiefly from the West Coast of Mexico.* By E. and C. BERKELEY, Pacific Biological Station, Nanaimo, B.C.

INTRODUCTION.

Several papers have appeared on the Polychæta of the coast of California and of Panama, but, although occasional references to species taken in the intermediary region occur in the literature, only those of Chamberlin (1919) and Treadwell (1923 and 1937) deal particularly with material collected there.

The majority of the species recorded in this paper come from the coast of Mexico. With a few exceptions, which are specified in the text, the material was collected by Capt. F. E. Lewis during the cruises of his yacht 'Stranger' in the years 1934 and 1937. He was assisted by Mr. W. Williams, of Pomona College, California, who was responsible for a large measure of the actual preserving and recording. A few specimens collected from points farther south and two from Haiti are included in the paper because, though not coming within the region specified in the title, they also were taken during the cruises of the 'Stranger' and seem to be worthy of record. The material was kindly submitted to us for examination by Dr. C. E. MacGinitie, of the Kerckhoff Marine Laboratory, Corona Del Mar, California.

Very few of the forms now listed are comprised in the former collections from the region. This may be due to the fact that the previous collections were made for the most part in deeper waters than were those of the 'Stranger.'

In the following complete list of the thirty-four species taken five, *Sigalion lewisii*, *Eulepethus mexicanus*, *Onuphis zebra*, *Arenicola glasselli*, and *Clymene papillata*, are recorded as new to science; and seven, *Eupholoe philippinensis*, *Hesione intertexta*, *Nereis rava*, *Glycera lancadivæ*, *Travisia arborifera*, *Dasychone picta*, and *Spirorbis militaris*, appear to be new records for the west coast of North or Central America.

The types of the new species are in the authors' collection, and co-types, when available, will be deposited in the British Museum.

AMPHINOMIDÆ.

Chloeia viridis Schmarda.
—— *pinnata* Moore.
Notopygos ornata Grube.
Eurythoe complanata (Pallas).

POLYNOIDÆ.

Halosydna californica (Johnson).
Lepidametria gigas (Johnson).
Lepidonotus pilosus Treadwell.

ACŒTIDÆ.

Polyodontes panamensis (Chamberlin).

SIGALIONIDÆ.

Sigalion lewisii, sp. n.
Eulepethus mexicanus, sp. n.
Eupholoe philippinensis McIntosh.

HESIONIDÆ.

Hesione intertexta Grube.

EUNICIDÆ.

Eunice antennata Savigny.
—— *biannulata* Moore.
—— *longicirrata* Webster.
—— (*Leodice*) *segregata* Chamberlin.
Onuphis magna (Andrews).
—— *zebra*, sp. n.
Diopatra ornata Moore.
Marphysa mortenseni Monro.

NEREIDÆ.

Nereis rava Ehlers.

GLYCERIDÆ.

Glycera lancadivæ Schmarda.

CHÆTOPTERIDÆ.

Chætopterus variopedatus (Renier).

OPHELIIDÆ.

Travisia arborifera Fauvel.

ARENICOLIDÆ.

Arenicola glasselli, sp. n.

MALDANIDÆ.

Clymene papillata, sp. n.

SABELLARIIDÆ.

Idanthyrsus johnstoni (McIntosh).

TEREBELLIDÆ.

Loimia medusa (Savigny).
Thelepus setosus (Quatrefages).
Terebellides strœmi Sars.

SABELLIDÆ.

Laonome spectabilis Grube.
Chone infundibuliformis Kröyer var. *fauveli* McIntosh.
Dasychone picta McIntosh.

SERPULIDÆ.

Spirorbis militaris (Claparède).

Family **Amphinomidæ.**

Chloeia viridis Schmarda.

Monro, 1933 A, p. 9.

Occurrence.—Ventana Bay, Lower California (10 fms.); San Lucas Bay, Lower California (12 fms.); Espiritu Santo Is., Gulf of California (11 fms.); La Libertad, Ecuador; South Seymour, Galapagos; Puerto Vallerta, Mexico.

Remarks.—A number of specimens, varying in length from 45 mm. to 18 mm., agree with the descriptions of this species. The dorsal markings are as described by Monro, but vary a great deal in intensity in the various specimens. The colour of the setal bundles varies from a red-orange, through yellow, to an almost colourless condition. In one specimen smooth bifurcate notopodial setæ occur in the anterior region of the body, together with both smooth and serrate straight ones. In the remainder all are straight or have a very small spur, and may be smooth or serrate, and the serrations may be very coarse or little more than a roughening.

None of the specimens were taken at a greater depth than 12 fathoms. The two examples from Galapagos are marked " taken near surface of sea at night attracted by light."

Chloeia pinnata Moore.

Moore, 1911, p. 239 ; Monro, 1933 A, p. 7.

Occurrence.—Espiritu Santo Is., Gulf of California (11 fms.).

Remarks.—A single specimen is separated from the numerous examples of *Ch. viridis* and classified as above with some hesitation. The separation is based on the presence of the purplish pigment-spot in front of the lateral tentacles, which is regarded as characteristic by Monro, and on the absence of both well-defined dorsal markings and serrated dorsal setæ in the anterior region of the body.

The occurrence of this specimen, together with typical examples of *Ch. viridis*, and the fact that amongst the latter there are individuals with a slight indication of an anterior pigment-spot and others with very faint dorsal markings, throws some doubt on these characters as valid bases for differentiation.

Notopygos ornata Grube.

Monro, 1933 A, p. 10.

Occurrence.—San Lucas Bay, Lower California (12 fms.).

Remarks.—A single complete example about 30 mm. long is typical.

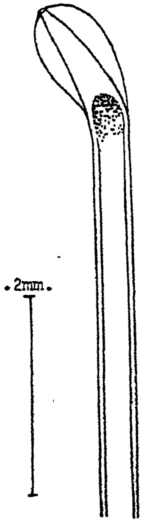
Eurythoe complanata (Pallas).

Potts, 1909, p. 367, with synonymy ; Treadwell, 1937, p. 141 (*E. pacifica*).

Occurrence.—Espiritu Santo Is., Gulf of California (littoral) ; Bay of Dulee, Mexico (20 fms.) ; Grayson Cove, Soccora Is., Galapagos (low-tide mark).

Remarks.—Six specimens agree generally with the many descriptions of this widespread form. Two of the four specimens from Soccora Is. have unusually narrow caruncles. The single example from the Bay of Dulee is too poorly preserved to identify with certainty. The largest specimen, that from Espiritu Santo Is., is about 175 mm. long and about 8 mm. wide. No eyes can be made out in this case. Anterior to the fifteenth somite a few of the straight smooth setæ in the dorsal ramus have enlarged and bent terminations (fig. 1). Posterior to that somite a number of the dorsal setæ are replaced by those of this peculiar type, but some of the large serrate ones always remain. Since agreement in other respects with *E. complanata* is very close we regard the presence of these setæ as an individual idiosyncracy.

Fig. 1.



Eurythoe complanata (Pallas). Abnormal dorsal seta.

Family **Polynoidæ.**

Halosydna californica (Johnson).

Polynoe reticulata Johnson, 1897, p. 170.
Polynoe californica, Johnson, 1901, p. 387.
Halosydna reticulata Moore, 1909, p. 241.
Halosydna californica Treadwell, 1914, p. 180.

Occurrence.—Georges Is., Gulf of California; Punta Peñasco, Sonora, Mexico (coll. Mr. S. A. Glassell); San Felipe, Gulf of California (coll. Mr. S. A. Glassell).

Remarks.—With the exception of the single individual from San Felipe, which is about 35 mm. long, the specimens are small. The twelve examples from Punta Peñasco agree fairly closely with Johnson's description, but the three from Georges Is. have ventral setæ and elytra of the type described by Johnson (1897) for *H. insignis* (*Polynoe brevisetosa*), whilst the remaining characters are those of *H. californica.* The latter specimens have exceptionally broad and strong cirrophores and a tendency to the development of pseudoelytrophores on the cirriferous segments.

H. californica and *H. insignis* are closely approximating forms, and intermediaries between them are frequently found. Such intermediaries are recorded by Monro (1928 A, p. 564) from Galapagos. On the coast of British Columbia, and generally on the more northerly region of the west coast of N. America, specimens agreeing exactly, or very closely, with *H. insignis* are found. In the region covered by the present collection examples approximating much more nearly with *H. californica* occur. On the Californian coast we have both forms and many intermediate grades. They occur throughout as commensals with the same, or nearly allied, hosts. It is a question whether they should be regarded as separate species.

Lepidametria gigas (Johnson).

Polynoe gigas Johnson, 1897, p. 172.
Lepidasthenia gigas, Moore 1909, p. 241.
Lepidametria gigas Monro, 1936, p. 92.

Occurrence.—San Felipe, Gulf of California (coll. Mr. S. A. Glassell).

Remarks.—The regular arrangement of elytra on alternate segments ceases at the forty-seventh instead of the forty-ninth setiger, and a secondary tooth can be made out in only a few of the ventral setæ. The setæ of the first two parapodia are as described by Monro except that a few minute bristles occur in the notopodium of the first and a single one in that of the second.

The specimen was found as a commensal with *Thelepus setosus* (Quatrefages).

Lepidonotus pilosus Treadwell.

Treadwell, 1937, p. 141.

Occurrence.—Espiritu Santo Is., Gulf of California (11 fms.).

Remarks.—A single specimen, in good condition, agrees closely with Treadwell's recent description of the type, which was taken in the same region.

Family **Acœtidæ.**

Polyodontes panamensis (Chamberlin).

Chamberlin, 1919, p. 86.

Occurrence.—Acapulco, Mexico (8 fms.).

Remarks.—Two anterior portions agree in all respects with *Panthalis panamensis* Chamberlin except that a few fine setæ are present at the base of the tentaculophores and that conical finger-like processes occur near the base of the dorsal cirrus, or beneath the elytron, on each parapodium from about the thirtieth. These are undoubtedly branchiæ, and their presence necessitates the above alteration of the generic classification. Chamberlin does not record the presence of branchiæ in the type-specimens. They were probably not observable. Monro (1930, p. 70) notes a similar instance of the difficulty of distinguishing definite branchial processes in *P. mortenseni.*

Panthalis adumbrata Hoagland, which is recorded by Treadwell (1937, p. 147) from the region covered by this collection, comes very close to this species. Probably they are identical.

Family **Sigalionidæ.**

Sigalion lewisii, sp. n.

Occurrence.—Espiritu Santo Is., Gulf of California (11 fms.); San José de Guatemala, Guatemala (10 fms.).

Description.—One complete specimen and two incomplete posteriorly. One of the latter, from San José de Guatemala, is the largest. It is 4·5 mm. wide at the widest point without the parapodia. The complete, and type-, specimen is from Espiritu Santo Is. It is 140 to 150 mm. long and 3 mm. wide.

The prostomium is longer than wide and is rounded anteriorly. There are four small black eyes. The eyes can be made out only with difficulty in the large specimen. There are two lateral tentacles on the anterior margin of the prostomium and a median one placed at the point at which diagonals joining the eyes would intersect. All three tentacles are short cones and about the same size. There are two smooth elongated palps, and immediately posterior to the bases of these and in the median line on the ventral side there is a conical facial tubercle.

The first parapodium is carried forward just above the palps, and bears the tentacular cirri, of which the ventral is longer than the dorsal. At the base of the first parapodium, on the inner and ventral side, there is a small projection (cephalic scoop ?). Subsequent parapodia have the rami well separated. On the dorsal surface there are three ctenidia and, on the fourth setiger and all setigers posterior to it, a cirriform stylode on the dorsal ramus. This stylode remains small up to the seventh setiger, but is well developed from the eighth setiger onwards. By the twenty-fifth setiger it is as long as the ventral cirrus and stouter, and it diminishes again in the posterior region.

Fig. 2.

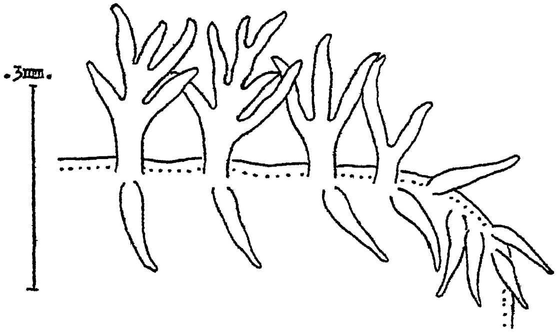
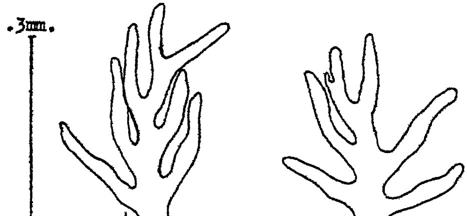


Fig. 3.



Sigalion lewisii, sp. n.

Fig. 2.—Edge of elytron of small specimen.
Fig. 3.—Papillæ from elytron of large specimen.

The ventral ramus of the parapodium also carries a small and rounded stylode on its upper side.

The elytra are arranged, as is usual in the family, in the anterior region of the body, and occur on every segment posterior to the twenty-fifth. They just meet over the body anteriorly and overlap posteriorly. They are of the usual shape and texture, and bear on the outer edge a row of about a dozen compound papillæ and, on the dorsal surface near the edge bearing these, a single row of long simple papillæ most of which arise from the base of one of the compound ones (figs. 2 & 3). There is a cirriform branchia on the dorsal tubercle, or on the elytrophore, of every setiger from the third. Those on the third and fourth setigers are small.

The setæ agree in general with those of *S. mathildæ* Audouin and Milne-Edwards, as described and figured by Fauvel (1923, p. 103), except in that the dorsal capillaries are finely bidentate and all the compound setæ in the ventral bundle have the ends of the shafts more or less spiny.

Classification of this species in the genus *Sigalion* would be rendered doubtful, owing to the presence of a median tentacle, were it not in such close agreement with that genus in all other particulars that we are led to conclude that the presence or absence of that character is not diagnostic. Treadwell (1914, p. 183) mentions a similar case in *S. pourtalesii* from California, McIntosh (1900, p. 432) refers, with some doubt, to the occurrence of a median tentacle in *S. buskii* McIntosh, and we have encountered the same feature in an example agreeing closely in all other respects with *S. ovigerum* Monro from California. Except in this character *S. lewisii* approximates to both *S. mathildæ* and *S. pourtalesii*. It differs from the latter in the presence of a stylode on the ventral ramus of the parapodium, and from both in the form of the papillæ at the margin of the elytra and the detailed structure of some of the setæ.

We take pleasure in naming the species after the owner and master of the yacht 'Stranger,' Capt. F. E. Lewis.

Eulepethus mexicanus, sp. n.

Occurrence.—Isle Grande Bay, Mexico (6 fms.).

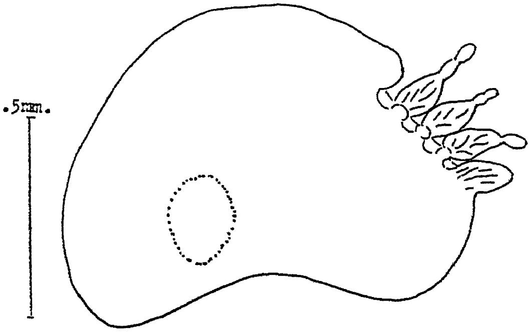
Description.—A single complete, but somewhat poorly preserved, specimen is about 15 mm. long and about

3 mm. wide at the widest region of the body. It consists of 38 segments.

The prostomium, which is completely hidden by the first pair of elytra, is rounded in front and carries three short, equal, conical tentacles, the laterals inserted on the anterior edge and the median posterior to them by a distance about equal to their length. The palps are well developed, smooth, and tapering to fine points. They extend beyond the front pair of elytra.

Elytra occur on segments 2, 4, 5, 7, 9 . . . . 21, 24, 27, 29, 30 . . . . 37. Those which occur on every segment in the posterior region are extremely small. They overlap over the greater part of the length of the body. The first are circular, the next few reniform, and thereafter they are irregularly ovoid, with the long axis along the length of the body. Their surface is almost smooth (a few very flattened, almost circular tubercles can be detected at high magnification, particularly on more anterior ones) and the edge has no notch such as occurs in *E. hamifera* Grube and *E. wyvillei* McIntosh. There is a fringe of minute papillæ on the anterior and outer edge of the first pair. On the second and third pair there are a few large semi-articulated papillæ on the outer edge (fig. 4), and succeeding elytra have on their outer edge about nine or ten large simple papillæ (fig. 5). The elytra become abruptly very small in the posterior region of the body, and are attached at the extreme

Fig. 4.



Eulepethus mexicanus, sp. n.
Elytron from fourth segment.

Fig. 5.

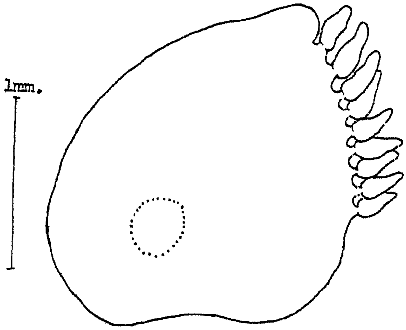


Fig. 6.

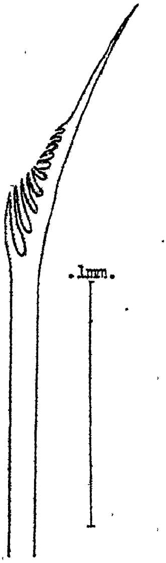
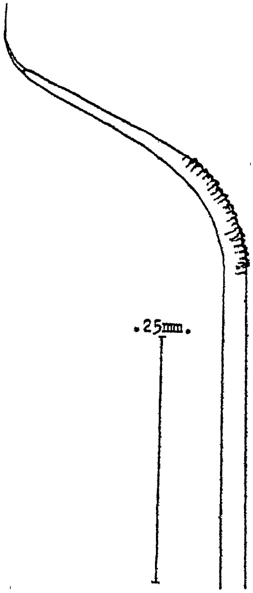


Fig. 7.



Eulepethus mexicanus, sp. n.

Fig. 5.—Elytron from median region.
Fig. 6.—Serrated bristle from ventral ramus.
Fig. 7.—Geniculate bristle from ventral ramus of median region.

anterior edge as is described by Grube (1878, p. 53) in the case of *E. hamifera.* The flat pads occurring on the segments which do not carry elytra in the anterior region of the body are in agreement with the descriptions given by Grube for *E. hamifera* and by McIntosh for *E. wyvillei* (1885, p. 131).

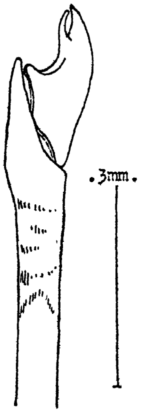
The first parapodium is as figured by Grube (1878, pl. iii. fig. 8) for *E. hamifera.* It is carried pointing directly forward and bears two large bunches of fine capillaries which extend beyond the palps and cover them.

The dorsal ramus of the second parapodium is small and bears a bunch of fine smooth capillaries and some heavier, slightly bent, serrated setæ. The ventral ramus is much larger and carries dorsally a fan of stout, curved, winged setæ with fine tips. In addition there are one or two peculiar serrated bristles (fig. 6) similar to those figured by McIntosh (1885, pl. xiv. A, figs, 4 and 8) for *E. wyvillei* and *E. challengeriæ*, but not mentioned by Grube in *E. hamifera*, and several long, stout, smooth spines. Ventrally there is a bunch of short fine capillaries. The ventral cirrus is heavy and projects beyond the end of the foot and has a clavate tip.

In the typical parapodium, which occurs in the median region of the body,the dorsal ramus bears a supra-acicular bundle of seven or eight heavy geniculate bristles similar to those figured by McIntosh (1885, pl. xiv. A, fig 7) for *E. challengeriæ*, but bent more acutely and ciliated on the upper edge to the tip, and, ventrally to the aciculum, a group of two or three similar but moreslenderones, and a large bunch of very fine capillaries, some of which are smooth but the majority of which are delicately pectinate. These capillaries are long, projecting twice as far from the parapodium as any other setæ. In the ventral ramus, above the aciculum, there is a single specialized serrated bristle (fig. 6), two or three moderately stout bladed and curved setæ with bent tips, and about four geniculate setæ which are not as stout as those in the dorsal ramus and are somewhat corrugated at the bend (fig. 7). Below the aciculum there is a fan-shaped tuft of rather slender bladed setæ with fine straight tips similar to those of *E. wyvillei* (McIntosh, 1885, pl. xiv. A, fig. 6). The ventral cirrus is a small ovoid projection with a clavate tip.

Remarks.—The genus *Eulepis* was set up by Grube (1878) for the Philippine species *E. hamifera.* Chamberlin (1919) pointed out that this generic name was preoccupied, and suggested *Eulepethus* in its place. The genus is a rare one. The present species is a typical representative. The depth at which it was taken is remarkably shallow in comparison with that at which the 'Challenger' species were secured. The latter were dredged in over 400 fms., whilst the present species was collected in only 6 fms. The depth at which Grube's species was taken is not recorded.

Fig. 8.



Eupholoe philippinensis McIntosh. Uninjured neuroseta.

Eupholoe philippinensis McIntosh.

McIntosh, 1885, p. 157.

Occurrence.—Espiritu Santo Is., Gulf of California (11–15 fms.).

Remarks.—Two examples agree closely with McIntosh's description except that the neuroseta, when uninjured, has a slender secondary tooth (fig. 8). In most of these setæ this tooth is broken off, in which case they resemble McIntosh's figure (pl. xiii. A, fig. 17) very closely. Some neurosetæ with long terminal pieces, similar to those figured by Treadwell (1936, pl. i. fig. 14) for *E. nuda*, also occur. Many of these also have lost the secondary tooth. We are inclined to think that *E. nuda* is actually an example of *E. philippinensis* in which the elytra have fallen off, the scars been covered with incrusting sand, and the heavier neurosetæ lost their secondary teeth. In the present specimens the incrustation is fairly uniform throughout the body and consists of fine particles of shell.

Family **Hesionidæ.**

Hesione intertexta Grube.

Grube, 1878, p. 102.
Hesione panamena Chamberlin, 1919, p. 188.

Occurrence.—Espiritu Santo Is., Gulf of California (11 and 15 fms.).

Remarks.—Two specimens agree with Grube's description except that in one of them no tentacles can be made out, nor is there any evidence that they have been broken off. Treadwell (1937), in recording *H. panamena* from Clarion Is., finds the same condition with regard to the tentacles, and points out that Chamberlin also failed to find them in the type. We would have recorded their absence in the present instance but that in one of our specimens, which had become partially dry and withered, two very minute tentacles were visible. Evidently they may be exceedingly small and may possibly be retractile.

Treadwell differentiates *H. panamena* from *H. intertexta* partly on the absence of tentacles. Monro (1928 B, p. 79) looks upon the two species as synonymous. It seems to us that with the observation of the tentacles no ground for keeping them separate remains.

The guard of the compound seta just reaches the top of the main hook except in the two longest setæ in one specimen, in which case it extends beyond the tip.

Family **Nereidæ.**

Nereis rava Ehlers (?).

Ehlers, 1864–1868, p. 517 ; Fauvel, 1923, p. 339.

Occurrence.—Espiritu Santo Is., Gulf of California.

Remarks.—An incomplete specimen is doubtfully attributed to this species. The prostomium and its appendages, the shape of the parapodium, and the setæ agree with the descriptions, but the armature of the proboscis disagrees in that there are two paragnaths on I. (Ehlers says one occurs rarely) and there is a double short row on VI. instead of a single row.

Family **Glyceridæ.**

Glycera lancadivæ Schmarda.

Fauvel, 1932, p. 125.

Occurrence.—San José de Guatemala, Guatemala (10 fms.).

Remarks.—Two specimens, only one of which is complete. The parapodia are very long and have two anterior lobes and one posterior. They correspond exactly with Fauvel's descriptions and figures of those of *G. longipinnis* except that no branchiæ are present. Fauvel points out that this is the condition in *G. lancadivæ.* The papillæ of the proboscis agree with his description, but the supports of the jaws do not. These are long and diverging, as in *G. tesselata.* Having regard to this last character the present species may be a link between *G. longipinnis* and *G. lancadivæ.*

Family **Eunicidæ.**

Eunice antennata Savigny.

Treadwell, 1922, p. 136; Monro, 1933 A, p. 59.

Occurrence.—Port au Prince, Haiti; Tiburon Is., Gulf of California.

Remarks.—Four specimens are identified as this species chiefly by the characteristic distribution of the branchiæ, which have only a few branches in the mid-region of the body and are more complex towards the posterior end. In the largest of the three examples from Haiti, which measures about 60 mm. in length and 3 mm. in width at the widest point, the branchiæ start on the fifth setiger with one branch on one side of the body and two branches on the other; the number of branches increases gradually in more posterior parapodia until a maximum of eleven is reached at the fifteenth setiger, and this number is maintained for about six segments. From about the twenty-second setiger the number of branches decreases until about the thirtieth, where only two are present, and this condition is maintained until the last sixth of the body is reached. In this region the complexity of the branchiæ increases again gradually until there are five branches. The extreme anal end of the body is regenerated, and the condition of the branchiæ therefore cannot be determined, but there are five branches on the last pair which can be clearly made out.

In the single example from Tiburon Is., which is much contracted but would measure about 35 mm. in extended length, the branchiæ reach a maximum of six branches at the twelfth setiger, remain at the maximum for two or three setigers, and then decrease to a single branch, at which condition they remain throughout the median region of the body. The number of branches increases to three at the posterior end.

In all four specimens agreement with the descriptions of *E. antennata* is close. The tentacles are strongly moniliform, but the tentacular and dorsal cirri are only articulated. In the two smaller specimens from Haiti, which measure about 30 mm. and 22 mm. respectively in length, the increase in the number of branches in the posterior branchiæ does not occur, but they agree in all other respects. A portion of a membranous tube incrusted with algæ is put up with these specimens. They may belong to Monro's variety *ædificatrix* (1933 A, p. 60).

Eunice biannulata Moore.

Moore, 1904, p. 487.

Occurrence.—Arena Point, Lower California (11 fms.).

Remarks.—An anterior portion about 4 mm. wide exclusive of the parapodia. The dorsal cirrus is characteristic. It is distinctly articulated, the articulations dividing it into three parts, of which the basal is much larger than the distal ones. We can see little to differentiate Hartman's variety of *E. longicirrata* Webster (Hartman, 1938, p. 97) from this species.

Eunice longicirrata Webster.

Webster, 1884, p. 318; Monro, 1930, p. 121; Treadwell, 1921, p. 11.

Occurrence.—Espiritu Santo Is., Gulf of California.

Remarks.—A number of specimens agree closely with the descriptions. The compound seta has a well-developed secondary tooth. This is in accord with the original description of Webster and that of Monro, but not with that of Treadwell. In preserved material, in which little colour remains, this species can be readily distinguished from *E. biannulata* Moore only by the form of the dorsal cirrus, which, in *E. longicirrata*, is very faintly and irregularly articulated and has seven to nine articulations. The maximum number of gill-filaments in the two species is of little value as a basis of differentiation, since it varies considerably with the size of the specimen in both cases. Their areas of distribution overlap. A specimen of *E. biannulata* from Elkhorn Slough, Monterey Bay, California, was wrongly placed in the species *E. longicirrata* by us (1935, p. 771), since we overlooked the character of the dorsal cirrus.

Eunice (*Leodice*) *segregata* Chamberlin.

Chamberlin, 1919, p. 237.

Occurrence.—Puerto Vallerta, Mexico (10 fms.).

Remarks.—An anterior portion, measuring about 50 mm. for 70 segments and about 5 mm. broad at the greatest width, is attributed to this species with some doubt. The abrupt increase in the number of filaments on the second branchia, which is on the fourth setiger and has 13 filaments, is very characteristic. The branchia reaches its maximum complexity at the twelfth setiger with 20 filaments. The complexity gradually decreases posteriorly until only one filament is present on the fortieth setiger. They cease entirely at the forty-fifth setiger.

As preserved the specimen does not show the yellow lateral line described by Chamberlin, the colour being an almost uniform rich red-brown, with very narrow white intersegmental lines. The tentacles are definitely articulated distally, and the acicular hook does not correspond very closely with Chamberlin's figure, though it is bidentate.

Nevertheless, having regard to the general agreement in characters, particularly that of the branchiæ, and to the fact that the specimen was collected in the region of one of the localities from which it was originally described, we think it probable it should be placed here. If we are right in so doing it is worthy of note that the specimen was taken in considerably shallower water than those previously collected.

Onuphis magna (Andrews).

Andrews, 1891, p. 286; Treadwell, 1921, p. 78; Monro, 1933 A, p. 76.

Occurrence.—Puerto Vallerta, Mexico (10 fms.).

Remarks.—An anterior fragment about 15 mm. long for 30 setigers. The width across the first five setigers is about 5 mm. It increases abruptly at the sixth setiger and reaches 10 mm. at the twentieth. Both the dorsal and ventral surfaces of the anterior segments are heavily spotted, as figured by Treadwell (pl. vii. fig. 2). The comb-bristles are as described by Monro.

Onuphis zebra, sp. n.

Occurrence.—Punta Gorda, Lower California.

Description.—An anterior portion of a single specimen measures 28 mm. for 50 segments. It is about 3 mm. wide at its greatest width.

The general body-colour, as preserved, is a pale yellow with ivory-white appendages. The tentacular styles are heavily dusted with small brown spots and there is a broad band of dark brown near the distal end of the tentaculophores of the five occipital tentacles. There is a broad dark brown band across the posterior portion of each somite, particularly conspicuous on the first twenty, and in front of this on most somites there is a large white medial patch.

The palps are oval and extend laterally. The frontal tentacles are broadly subulate. The five occipital tentacles have long annulated tentaculophores, those of the inner laterals having about 15 rings and those of the median about 10. The styles are long and smooth. In respect of the form of the tentacles and tentaculophores the species resembles *O. eremita* Audouin and Milne-Edwards very closely, but differs from it in most other respects. No eyes can be made out. The first five setigers project forward, the first reaching the front of the prostomium. Their dorsal cirri are unusually long and prominent, those of the second to the fifth segments extending forward for the combined length of three segments. Their ventral cirri are subulate and well developed, and they are stouter than the dorsal cirri but less than half their length. Their posterior lobes approximate in size and shape to the ventral cirri.

The branchiæ are pectinate and start on the sixth setiger with 3 branches. There are 4 branches on the seventh setiger, and this number continues until the fourteenth, where there are 5 branches. The number gradually increases on more posterior parapodia until there are 8 on the fiftieth setiger, where the fragment ends. The main stem of the branchia becomes very heavy relative to its branches in the more complex branchiæ. The ventral cirrus disappears at the eleventh setiger.

The setæ of the first five setigers consist of fine capillaries and characteristic tridentate pseudo-compound hooded bristles of two kinds (fig. 9, A & B). Posterior to the fifth setiger there are fine-bladed capillaries, the subacicular of which tend to be pseudo-compound, and a few comb-setæ with slightly oblique ends and about 12 very fine long teeth. The acicula are yellow and have rounded ends with pointed guards (fig. 10). No heavy acicular hooks were observed.

Fig. 9.

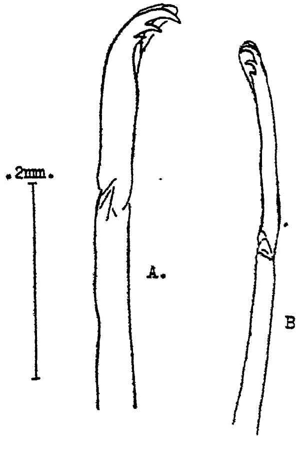
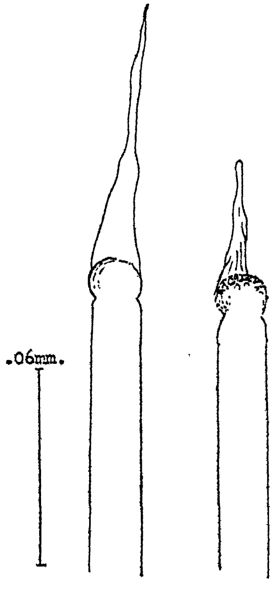


Fig. 10.



Onuphis zebra, sp. n.

Fig. 9, A & B.—Tridentate bristles from third setiger.
Fig. 10.—Acicula from twenty-second setiger.

Diopatra ornata Moore.

Moore, 1911, p. 273.

Occurrence.—Las Animas Bay, Gulf of California; Tenacatita Bay, Mexico; Isle Grande Bay, Mexico.

Remarks.—The specimen from Las Animas Bay is in two pieces, one of which is badly curled. They would measure together at least 240 mm. in length when extended. It is 7 mm. wide between the tips of the parapodia. This is considerably larger than Moore's specimens or than those recorded by Monro (1933, p. 73) under *D. dentata*, which he regards as synonymous with *D. ornata*, but specimens of this order of size are not uncommon in more northerly latitudes.

Marphysa mortenseni Monro.

Monro, 1928 B, p. 86.

Occurrence.—Espiritu Santo Is., Gulf of California (11 fms.).

Remarks.—A single specimen agrees in all essential particulars with Monro's description. Dissection of the jaws shows the peculiarity to which he refers, but the numbers of the maxillary teeth are not identical. In our specimen the left-hand plate of max. III. seems to engage on the right-hand plate of both max. III. and max. IV., so that the formula could be written either 6–7 ; 6–0 ; 4–8 or 6–7 ; 6–8 ; 4–0.

Family **Chætopteridæ.**

Chætopterus variopedatus (Renier).

Fauvel, 1927, p. 77.

Occurrence.—Estero de la Punta Bunda (near Ensenada), Lower California.

Remarks.—A single typical specimen collected by Mr. S. A. Glassell, of Beverly Hills, California, and recorded by him as host of the commensal crab *Polyonyx quadriungulatus* Glassell (1935, p. 93). This widespread species has been taken in the Panama region and Galapagos, but has not previously been recorded from the coast of Mexico. It occurs off the coast of California, but does not seem to come much farther north on the west coast of America.

Family **Opheliidæ.**

Travisia arborifera Fauvel.

Fauvel, 1932, p. 191.

Occurrence.—San José de Guatemala, Guatemala (10 fms.).

Remarks.—The single specimen has about 44 segments, but the last few are very crowded and difficult to count. As preserved it is about 50 mm. long and 6 mm. wide.

It is thus longer in relation to its breadth than as it is described by Fauvel, and could hardly be regarded as "spindle-shaped." Nevertheless the close agreement in all characters, particularly those of the very unusual type of branchia, leaves no doubt as to its identity.

Family **Arenicolidæ.**

Arenicola glasselli, sp. n.

Occurrence.—San Felipe, Gulf of California (littoral).

Remarks—Collected by Mr. S. A. Glassell, of Beverly Hills, California, who has recorded it, without specific name, as the host of the commensal crab *Pinnixa pembertoni* Glassell (1935, p. 102). We are glad to name the species after its collector.

Description.—Body cylindrical, tapering at the extremities, strongly annulated. Average length of fourteen somewhat contracted specimens 90 mm., the longest 110 mm. Prostomium with median lobe well developed and lateral lobes insignificant, much as in *A. cristata* Stimpson. Otocysts containing a single large spherical otolith as in that species. Anterior region of six uncinigerous segments without branchiæ. Abdominal region of ten segments bearing well-developed pinnate branchiæ. Caudal region about one-fifth the total body-length. Dorsal setæ straight and spiny to the tip. Uncini almost straight, with a slightly contracted and bent tip. There are seven pairs of nephridia opening on the fifth to the eleventh setigerous segments. The anterior diaphragm has two well-developed pouches. There is a pair of heavy bluntly conical œsophageal glands.

The species comes near to *A. cristata* Stimpson. The smaller size (of sexually mature individuals), the presence of only 16 setigerous segments and 10 pairs of branchiæ, and, particularly, the presence of 7 pairs of nephridia, all of which characters are constant in the material examined, seem to sufficiently differentiate it from *A. cristata* to necessitate the establishment of a new species.

Family **Maldanidæ.**

Clymene (*Euclymene*) *papillata*, sp. n.

Occurrence.—Punta Peñasco, Sonora, Mexico.

Remarks.—Collected by Mr. S. A. Glassell, of Beverly Hills, California, who has recorded it, without specific name, as host of the commensal crab *Pinnixa plectrophoros* Glassell (1935, p. 102).

Description.—Two complete specimens and a number of fragments. The two complete specimens are both reconstructed, one from two pieces and the other from three. The former measure jointly about 85 mm. in length, the latter about 65 mm. Both are approximately 2 mm. wide in the anterior region.

In general appearance the species resembles *Cl. grossa* Baird, as figured by Ehlers (1901, pl. xxv. fig. 1). There are 19 setigers and two achætous preanal segments. The cephalic plate is oval and is placed more or less obliquely; it has a broad and rather flaring rim with deep lateral notches. Its posterior margin is very irregularly divided into 12 to 15 blunt teeth. The palpode is low and rounded and the nuchal grooves are deep and extend to about halfway between the palpode and the posterior margin. The surface of the cephalic plate is covered with numerous blunt papillæ (fig. 11).

Fig. 11.

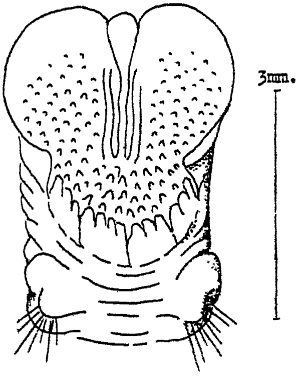
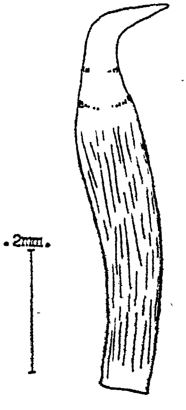


Fig. 12.



Clymene (*Euclymene*) *papillata*, sp. n.
Fig. 11.—Head.
Fig. 12—Hook from first setiger.

White glandular bands are present from the fifth to the eighth setiger. The first three setigers have one or two heavy neuropodial hooks (fig. 12). In more posterior setigers these are replaced by uncini similar to that figured for *Cl. tropica* by Monro (1928 B, p. 98, fig. 18).

The dorsal setæ also are similar to those of this latter species. The anal cup has twenty to twenty-five irregularly unequal cirri, and is a shallow saucer covered on the concave side with blunt papillæ like those present on the cephalic plate. There is little or no sign of an anal cone.

This species comes near to *Cl. tropica* Monro, but differs from it in the papillated cephalic plate and anal cup, in the more complex division of the posterior margin of the cephalic plate, and in having two preanal achætous segments.

Family **Sabellariidæ.**

Idanthyrsus johnstoni (McIntosh).

McIntosh, 1885, p. 414.

Occurrence.—Grayson Cove, Soccora Is. (low-tide mark).

Remarks.—A number of specimens of this species are accompanied by a worn cluster of thick-walled hard sandy tubes which has almost the appearance of a piece of closely drilled sandstone. The habit of building colonies of this nature may account for the opinion expressed by Lord (1866, p. 350) that this or a very nearly allied species (which he records under the name *Sabellaria saxicava* (Baird)) bores into rock.

Family **Terebellidæ.**

Loimia medusa (Savigny) var. *annulifilis* Grube.

Fauvel, 1932, p. 224.

Occurrence.—Acapulco, Mexico (8 fms.).

Remarks.—An incomplete specimen about 7 mm. wide is identified as this variety chiefly on the basis of the form of the thoracic uncinus, which has four teeth and the subrostral spur well developed. Another poorly preserved specimen collected by Mr. S. A. Glassell off Lower California (exact locality unknown), and stated by him (private communication) to be the host of the commensal crab *Pinnixa abbotti*, has a similar thoracic uncinus and seems to belong here. It is recorded by Monro (1933 B, p. 1069) from the Panama region.

Thelepus setosus (Quatrefages).

Fauvel, 1927, p. 273 (with synonymy).
Thelepus crispus, Johnson, 1901, p. 428.
Thelepus triserialis (Grube), Fauvel, 1927, p. 274.

Occurrence.—San Felipe, Lower California (coll. Mr. S. A. Glassell).

Remarks.—A single complete specimen is much twisted, but would measure more than 25 cm. when extended. It harbours *Lepidametria gigas* (Johnson) as commensal.

We believe *T. crispus* to be the same as *T. setosus*, in spite of the fact that Johnson says uncini begin on the fourth somite in the former species. They are indistinguishable in any other particulars.

T. setosus has been recorded under the name *T. triserialis* (Grube) from the more northerly region of the west coast of N. America (Berkeley, 1929, p. 309, and 1932, p. 314). The characteristics on which these two species have been differentiated seem to be variable, and we are of the opinion that they are synonymous. The species frequently has the polynoid *Halosydna insignis* Baird as commensal in northern waters.

Terebellides stroemi Sars.

Fauvel, 1927, p. 291.

Occurrence.—Puerto San Carlos, Gulf of California.

Remarks.—A small but otherwise typical specimen.

Family **Sabellidæ.**

Laonome spectabilis (Grube).

Grube, 1878, p. 253.

Occurrence.—Port au Prince, Haiti.

Remarks.—Three specimens, none quite complete. The largest, which is complete excepting the branchiæ and is much contracted, is 95 mm. long and 13 mm. across the thorax. The others have both lost the extreme anal end. In both the latter cases the branchiæ measure between 50 and 60 mm., which would be considerably more than half the body-length. The branchiæ are heavily banded, as figured by Grube (pl. xiv. fig. 4). The setæ agree with Marenzeller's description and figure (1884, p. 213, pl. iii. fig. 5). Grube's description of the species is somewhat inadequate, but so far as it goes the present specimens seem to agree with it.

Chone infundibuliformis Kröyer var. *fauveli* McIntosh.

McIntosh, 1923, p. 290.

Occurrence.—Espiritu Santo I., Gulf of California.

Remarks.—Two complete specimens. The variety comes very close to the main species, differing only in the filiform tips to the branchial filaments and in the form of the abdominal uncinus (McIntosh, pl. cxxx. fig. 2 *b*). None of the spatulate thoracic setæ are mucronated, and the pygidium has no filiform appendage. Fauvel (1927, p. 335) regards *Ch. fauveli* McIntosh as a synonym of *Ch. infundibuliformis* Kröyer. They are certainly very nearly allied, and no more than varietal differentiation seems to be justified.

Dasychone picta McIntosh.

McIntosh, 1885, p. 497.

Occurrence.—Acapulco, Mexico (6–10 fms.).

Remarks.—A tangled mass of narrow flattened mud-tubes contained very poorly preserved small sabellids which are attributed as above with some doubt. The largest individuals examined were at least 40 mm. long and almost 2 mm. wide, but the bulk of the material consisted of much smaller individuals. The tubes adhered very strongly to the worms, which were difficult to remove uninjured.

The branchiæ have bands of colour varying through shades of reddish brown, and the branchial filaments have no eyes and very inconspicuous stylodes, exactly as figured by McIntosh (pl. xxxix. A, fig. 3). The character of the stylodes seems to be unique. There are prominent lateral eyes, which may be what McIntosh describes as "a minute reddish spot at each bristle-bundle." The setæ and uncini correspond to the descriptions and figures.

The material is too poorly preserved and McIntosh's description too inadequate to make identification certain.

Family **Serpulidæ.**

Spirorbis militaris (Claparède).

Fauvel, 1927, p. 402; Rioja, 1923, p. 137; Caullery and Mesnil, 1897, p. 215.

Occurrence.—South Seymour, Galapagos (10 fms.).

Remarks.—A few sinistral tubes on seaweed contained very small spirorbids in a poor state of preservation. The nature of the collar setæ and, in particular, the form of the operculum leave little doubt but that they belong to the above species. The operculum is of the characteristic helmet-like form and has the summit beset with rows of vertical spines. The summit is concave, much as figured by Rioja. This, according to Caullery and Mesnil, quoting Salensky, is characteristic of young forms.

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XXXIX.—*New and little-known African Bees of the Subfamily* Anthidiinæ (*Apoidea*).—Part III. By G. A. MAVROMOUSTAKIS, Limassol, Cyprus.

THE following abbreviations are used in this part:—B.M.=British Museum; T.M.=Transvaal Museum; S.A.M.=South African Museum.

Pachyanthidium (*Micranthidium*) *lanificum* subsp. *microdontum* (Ckll.).

The British Museum has a small series fom UGANDA: Kampala (*C. C. Gowdey*). The *male* has the clypeus ivory-white.

Pachyanthidium (*Micranthidium*) *truncatum* subsp. *neavei* (Vachal).

Through the kindness of Dr. H. Schouteden, Director, Congo Museum, Turvueren, I received for study 1 ♂ (type) of *Anthidium neavei* Vachal from Mfungwe-Kayumbe, vi. 07 (*S. Neave*), and that *male* (type) of *Anthidium neavei* is a subspecies of *Pachyanthidium truncatum* (Smith). The above male (type), which must be named *Pachyanthidium* (*Micranthidium*) *truncatum* subsp. *neavei* (Vachal), has the outer margin of the scutellum and axillæ narrowly marked with yellow, the occipital stripe interrupted in the middle, the clypeus and lateral face-marks cream, the tibiæ yellow with reddish suffusion (due to cyanide), and the colour on abdomen as in the typical race of *Pachyanthidium truncatum* (Ann. & Mag. Nat. Hist. (10) pp. 600–601, 1936), but the yellow changed to red by cyanide. I possess in my collection 1 ♂ of *Pachyanthidium truncatum neavei*, from CONGO BELGE : Kabinda (*J. Bequaert*), which is identical with the typical *male*, and having the abdomen regularly marked with yellow. Vachal's ♀ of *Pachyanthidium truncatum neavei* has the last abdominal tergite with broad lateral yellow mark and the occipital stripe interrupted in the middle. *Pachyanthidium truncatum livingstonei* Ckll., ♀, from Tanganyika Territory, has the outer margin of the axillæ marked with yellow and the occipital stripe entire.

Pachyanthidium (*Trichanthidium*) *cucullatum* (Friese).

Professor H. Bischoff has kindly examined the type-material of *Anthidium cucullatum* Friese in Zoological Museum, Berlin, and informed me as follows :—" For the description of *Anthidium cucullatum*, Friese has had three specimens before him, 2 ♀ and 1 ♂ ; first ♀ and the ♂ originate from Cape Land, the second ♀ from Delagoa Bay. All the specimens carry a type-label, and para- or allotype are not distinguished. Since there are now no doubt three species confused in this *Anthidium cucullatum* types, a lectotype has to be designated. In the description, Friese mentions as first locality : Cape Land. Appropriately one will raise one of the specimens from Cape Land to the lectotype. Since the description of the *female* precedes, and the description of the *male* refers to that of the *female*, there remains only the Cape Land *female*, so that I have made this selection. The *female* from Cape Land (lectotype) is very similar to that of the Delagoa Bay, in both the mesonotum is opaque, but the punctation of it, in the lectotype somewhat finer and a little denser. In the lectotype the punctation of the first tergite is almost uniformly dense and strong, whereas in the other *female* it is in the middle of the tergite much more scattered, finer and not so deep as at sides. The colour of the *female* lectotype black, with red-brown and yellow markings; red-brown are:—Mandibles, clypeus, hind margin of the vertex (the elevated margin transparently yellow-brown), scape of the antennæ and root of the flagellum, side lobes of the pronotum, tegulæ, fore margin of the mesopleuræ, sides and hind margin of the scutellum, small lateral spot on the abdominal tergites, sixth tergite entirely. Yellow spots are to be found on tergites 2 to 5, the spot on second and fifth are the smallest."

The Transvaal Museum has 1 ♀, 1 ♂ from Cape Land: Port St. John (*H. H. Swinny*), the female agrees with the description of the lectotype, but the yellow spots on second tergite lacking. The punctation of the scutellum dense and coarser than of the mesonotum. The South African Museum has 1 ♀ from Natal: Mfongosi (*W. E. Jones*), which agrees entirely with the description of the lectotype.

Pachyanthidium (*Trichanthidium*) *occipitale* Ckll.

Southern Rhodesia: Bulawayo, 1 ♀, 20. iii. 1924 (*R. H. R. Stevenson*); Umtali District, 1 ♀, 29. iii. 1931 (*P. A. Sheppard*); both agree with the original description, the punctation of the scutellum somewhat sparser than of the mesonotum in the middle; the punctation of first tergite dense and strong at sides, but finer and somewhat sparse in the middle; scape has the colour nearly red-brown or red-brown in the base and the apex beneath; Sawmills, 2 ♀, 22–27. xii. 1923 (*R. H. R. Stevenson*), both have sublateral yellow spots on third and fourth tergites, and with a very small yellow spot on fifth; Bulawayo, 1 ♂, 20. xii. 1922; the male has the clypeus lemon-yellow; first tergite with yellow stripes reaching sides, sublaterally and transversely notched; sixth tergite nearly red-brown; seventh tergite yellowish brown. All the above specimens in T.M.

Pachyanthidium (*Trichanthidium*) *occipitale* subsp. *umtalicum*, nov.

Female.—Length nearly 6 mm.

Scape entirely red-brown; sides of tergites 1 to 4 entirely and broadly red-brown; fifth and sixth tergites entirely red-brown; the small sublateral pale yellow spots on third and fourth tergites present, very small on fourth.

SOUTHERN RHODESIA: Umtali District, 1 ♀ (type), 21. ii. 1931 (*P. A. Sheppard*), in T.M.

Pachyanthidium (*Trichanthidium*) *occipitale* subsp. *natalicum*, nov.

The yellow abdominal spots entirely lacking; the lateral abdominal red-brown spots small; sixth tergite black, with red-brown sides and upper middle (black and red-brown in the paratype).

NATAL, 1 ♀ (type), 1 ♀ (paratype), 4. ii. 1928 (*Marley*), in T.M.

Pachyanthidium (*Trichanthidium*) *carinaticeps* Ckll.

The *male* agrees with the description; tegulæ with yellowish spot; femora brown and red-brown in the apex; clypeus shining, sparsely punctured at sides and impunctate in the middle; first abdominal tergite strongly punctured.

Female.—Length 5·5 mm.

Similar to the *male*; mandibles red-brown; clypeus red-brown, apical margins of tergites red-brown; sixth tergite black, with the sides and the apical margin red-brown; legs red-brown; femora red-brown above, brown beneath and red-brown in the apex.

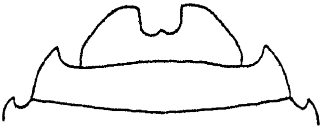
CAPE PROVINCE: Ceres, 1500 ft., 1 ♂, Dec. 1920, 1 ♀, Nov. 1920 (*R. E. Turner*); Mossel Bay, 1 ♀, 18–30. xi. 1921 (*R. E. Turner*), in B.M.; Willowmore, 1 ♀, 10. xii. 1906, 1 ♀, April 1923 (*H. Brauns*), in T.M.

This species differs from *Pachyanthidium cucullatum* or *Pachyanthidium occipitale* in the somewhat shining, strong, and sparse punctation of the mesonotum, the coarser and very shining punctation of the scutellum, the dark brown wings, and the different colour on abdomen.

Anthidium michaelis Ckll. subsp. *bechuanalandicum*, nov. (See figure.)

Female.—Length about 8 mm., breadth of abdomen 4·6 mm.

Head and thorax black; clypeus with a narrow reversed yellow T; mandibles with short yellowish basal mark; tegulæ with a yellowish mark in front; vertex, occiput, and mesonotum with very short and sparse white hairs; femora black-brown, middle ones with a narrow and short pale yellow stripe beneath; anterior tibiæ black-brown, with a pale lemon-yellow stripe above not reaching the apex; middle and hind tibiæ black-brown, with a broad pale lemon-yellow stripe above reaching the apex; tarsi black, last small joint reddish brown in the apex; spurs yellowish; middle and hind tibiæ with shining white hairs above; hind basitarsi with dense and short shining white hairs above and brown hairs on inner side. Abdomen robust and short; ventral scopa dense and white.



Fifth to seventh abdominal tergites of *Anthidium michaelis* Ckll. subsp. *bechuanalandicum*, nov., ♂.

Male.—Length 11 mm., breadth of abdomen 5 mm.

Clypeus, a basal and transverse supraclypeal stripe, lateral face-marks (filling space between clypeus, supraclypeal area, and eyes) reaching level insertion of antennæ yellow; mandibles tridentate, mostly yellow, teeth deep reddish brown; clypeus, sides of face with white hairs; vertex and occiput with some very short and sparse whitish hairs. Thorax black; mesonotum with a lateral stripe, outer side of axillæ and broadly the apical margin of scutellum, all yellow; mesonotum and scutellum strongly and densely punctured and dullish; scutellum sharply edged, rounded at sides, and emarginate in the middle; between axillæ and scutellum a slight incision; tegulæ finely punctured, black-brown, with a pale yellow mark in front and behind; thorax with very short and sparse white hairs above and somewhat dense white hairs at sides; wings slightly clouded, apical margin and a streak on upper part of marginal cell clouded; femora black-brown; anterior and middle femora with a lemon-yellow stripe beneath; hind femora with very short lemon-yellow mark beneath; tibiæ pale lemon-yellow above and deep brown beneath; anterior and middle tarsi with basitarsi pale yellow, small joints reddish brown; hind tarsi black-brown except the pale yellow basitarsi; middle and hind tibiæ with shining white hairs above; basitarsi with dense and short shining white hairs above, hind ones with dense and short brown hairs on inner side; pulvilli absent; spurs yellowish. Abdomen moderately shining, finely punctured, the punctures of second and third tergites very fine and somewhat dense a little above the apical margin; first and second abdominal tergites black, with large lateral yellow mark; tergites 3 to 7 mostly yellow; third tergite slightly and bluntly angulate at sides; fourth tergite angulate at sides; fifth tergite with a tooth on each side; sixth tergite with the apical margin entire and a broad lateral tooth; seventh tergite with two broad rounded lobes, deeply incised between, and in the middle of the rounded incision a very small projected spine (see figure); a tuft of shining white hairs on first tergite laterally and a transverse row of golden bristles on tergites 3 to 5; sixth ventral segment broader than long, base black, rest yellowish brown, apical margin angulate laterally and slightly concave in the middle.

N. BECHUANALAND: Gahnzi, Mongatatsila, 1 ♀ (type), 13. v. 1925 (*J. Maurice*), in B.M.; N'Kate, Makarikari, 1 ♂ (allotype), 6–23. viii. 1930 (*G. van Son*, in Vernay-Lang Kalahari Expedition 1930), in T.M.

Differs from the typical race of *Anthidium michaelis* Ckll., from Lubumbashi, in the smaller size of the *female*, the clearer wings, and the different colour of the pilosity and integument.

Anthidium capicola subsp. *ausicola*, nov.

Female.—Length about 6 mm.

Black; mandibles yellow, apex deep reddish brown; scape, second and third antennal joints black-brown, rest of flagellum yellowish brown beneath and brown above; a linear stripe along inner orbits to the top and a very small mark above each eye yellow; clypeus, sides of face, with sparse white hairs; vertex and occiput with shining white hairs. Thorax black, somewhat sparsely punctured and shining; scutellum rounded, with apical short yellow stripe; thorax with very sparse and short white hairs above and at sides; femora black, apex broadly yellowish brown; anterior tibiæ yellow above and yellowish brown beneath; middle and hind tibiæ yellowish brown, with broad yellow stripe above nearly reaching the apex; tarsi nearly yellowish brown; hind tarsi yellowish brown, apical half of basitarsi and the second small joint brown; pulvilli absent; spurs pale yellow; hind basitarsi with sparse shining white hairs on outer side and somewhat dense short yellowish-white hairs on inner side; wings nearly clear. Abdomen very shining; base of tergites 1 to 5 broadly black, rest including the median narrow transverse keels all pale yellow; sixth tergite pale yellow, basal sides black, apical margin very narrowly black-brown; tergites 1 to 5 with the black part finely and densely punctured, the keels smooth and with very sparse regular punctures, rest very finely and densely punctured, apical margins narrowly impunctate and smooth; last abdominal tergites without lateral angles; ventral scopa yellowish white.

Male.—Length 6·5 mm.

Similar to the female; the keels of abdominal tergites 1 to 4, basal half of fifth, and entirely the sixth deep yellow; fourth tergite with the base very narrowly black; tergites 1 to 5 with the disk below the keels pale subhyaline; seventh tergite deep yellow; apical margin of sternites entire; sixth sternite flat, punctured, apical margin rounded.

S.W. Africa: Aus, 1 ♀ (type), 1 ♂ (allotype), 8–30. xi. 1929 (*R. E. Turner*), in B.M.

XL.—*Notes on the Eels of the Family* Synaphobranchidæ.

By J. R. Norman and Ethelwynn Trewavas, D.Sc., Department of Zoology, British Museum (Natural History).

In his interesting and valuable contribution to our knowledge of the life-histories of these oceanic eels Bruun [*] has brought together data of considerable taxonomic importance. Working mainly upon the larval material obtained by the various Danish Oceanographical Expeditions he has found that the Leptocephali can be divided into a number of forms, distinguished especially by differences in the numbers of myomeres. With the exception of the two better-known Atlantic forms, *Synaphobranchus kaupii* and *S. infernalis*, he has found it impossible to associate a particular larval form with one or other of the several described species of this genus, since the numbers of vertebræ in the adults are not known. The material in the British Museum is quite inadequate to allow of anything even approaching a revision of the family, but, in view of the fact that it contains the valuable 'Challenger' specimens and includes the types of five described species, it has been considered desirable to place on record certain data concerning this material. It is hoped that the measurements and vertebral counts given in this paper may prove of assistance to other workers on the family.

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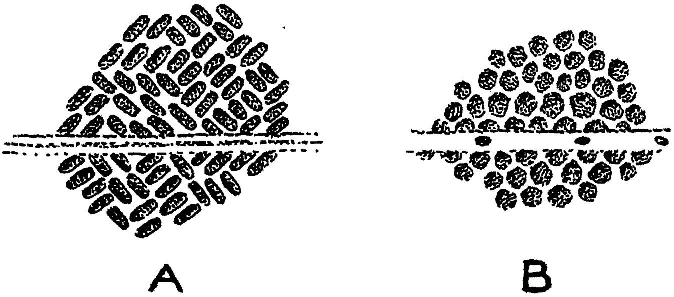
[*] 1937, 'Dana' Report, no. 9.

Fig. 1.

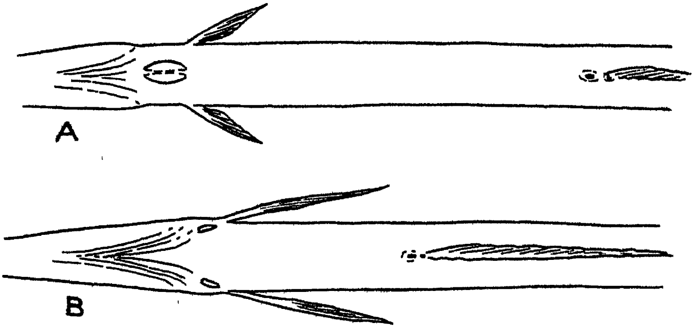


Sketches of the scales (at the middle of the body) of A. *Synaphobranchus kaupii*; B. *S. brevidorsalis*.

Through the kindness of Dr. G. S. Myers and Dr. Dorothy J. Starks, both of Stanford University, we have been able to obtain measurements and X-ray photographs of the type of *Synaphobranchus iraconis* (Stanford Nat. Hist. Mus. no. 6465); Mr. Leonard P. Schultz, of the United States National Museum, has kindly sent us the same data and X-ray pictures of the types of *S. jenkinsi* (U.S.N.M. no. 49727) and *S. brachysomus* (U.S.N.M. no. 51591).

The various proportional measurements in this paper have been expressed as percentages of the total length (T.L.), including the caudal fin, in the manner adopted by Bruun. These include the length of the head, measured from the tip of the snout to the posterior part of the gill-opening (H.); the length of the mouth-cleft, measured from the tip of the snout to the angle of the gape (M.); the length of the pectoral fin (P.); the pre-dorsal distance, measured from the tip of the snout to the origin of the dorsal fin (P.D.); and the pre-anal distance (P.A.).

Fig. 2.



Sketches of ventral surfaces of A. *Synaphobranchus brevidorsalis*; B. *Diastobranchus capensis*.

The vertebral counts have been made from X-ray negatives, prepared for us in the musuem by Mr. P. E. Purves.

For the present we have been content to recognize two genera of Synaphobranchidæ—*Synaphobranchus* and *Diastobranchus*. The groups *Synaphobranchus* and *Histiobranchus*, distinguished by the length of the dorsal fin and the form of the dentition, are here regarded as subgenera. It may be pointed out that, with certain minor variations, the type of dentition described by Bruun * for *Synaphobranchus kaupii* is also found in *S. affinis*, *S. indicus* (?), *S. jenkinsi*, and *S. brevidorsalis*, and that described for *S. infernalis* also occurs in *S. bathybius* and

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* 1937, *t. c.* p. 5, fig. 1.

S. australis. Matsubara[*] has recently suggested that the group regarded by us as the subgenus *Synaphobranchus* represents a single variable species and that the position of the origin of the dorsal fin has little if any taxonomic importance within this group. This author has not made any vertebral counts, however, and the fact that the scales of *S. brevidorsalis* and *S. jenkinsi* are rounded (fig. 1, B), and thus differ from those of the other members of the group as well as from those of the *Histiobranchus* group, suggests that there are at least two species of the subgenus *Synaphobranchus*, and perhaps more local races.

The separate gill-openings and anterior position of the vent serve to distinguish the genus *Diastobranchus* (fig. 2, B), which in these characters approaches the eels of the related family Dysommidæ. The family Ilyophidæ is very closely related to the Synaphobranchidæ, but, according to Barnard[†], may be distinguished by the vertical suspensorium.

Genus SYNAPHOBRANCHUS.

Subgenus SYNAPHOBRANCHUS.

1. *Synaphobranchus kaupii* Johnson[‡].

1862, Proc. Zool. Soc. London, 1862, p. 169.
Synaphobranchus pinnatus, Günther, 1870, Cat. Fish. viii. p. 23.
Nettophichthys retropinnatus Holt, 1891, Sci. Proc. R. Dublin Soc. n.s. vii. p. 123.

Loc.	T.L.	H.	M.	P.	P.D.	P.A.	V.
Atlantic [After Bruun]—7 spec.	153 to 547	10·9 to 12·4	6·9 to 8·8	5·2 to 6·5	31 to 41·3	25·5 to 27·8	—
Atlantic—7 spec.	267 to 739	12·4 to 13·5	7·2 to 8	5·4 to 6·4	31·8 to 40·6	27·2 to 30·3	147 to 150
Off Cape Point, S. Africa—6 spec.	441 to 482	12·2 to 13·1	7·2 to 7·7	4·7 to 5·2	35·9 to 39·7	26·4 to 29·05	146 to 151

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[*] 1938, J. Imp. Fish. Inst. Tokyo, xxxiii. no. 1, p. 60.

[†] 1925, Ann. S. Afric. Mus. xxi. p. 182.

[‡] For complete references to the various forms of the subgenus *Synaphobranchus* see Matsubara (1938, *l. c.* p. 64).

Bruun gives the number of vertebræ in adult specimens as ranging from 146 to 152, and the number of myomeres in larval specimens as 143 to 154.

This species seems to be confined to the Atlantic.

2. *Synaphobranchus iraconis*, Jordan & Snyder.

1901, Proc. U.S. Nat. Mus. xxiii. p. 844, fig. 1.

Loc.	T.L.	H.	M.	P.	P.D.	P.A.	V.
Off Miyako, Japan (holotype).	594	12·12	6·55	6·4 * to 6·9	33·9	28·08	146

This species, known only from Japan, is very doubtfully distinct from *S. kaupii*. The mouth appears to be a little smaller, but this discrepancy may be due to the manner of measurement.

3. *Synaphobranchus affinis* Günther.

1877, Ann. & Mag. Nat. Hist. (4) xx. p. 445.

Synaphobranchus brachysomus Gilbert, 1905, Bull. U.S. Bur. Fish. xxiii. (1903) p. 583, fig. 232.

? *Synaphobranchus taketæ* Tanaka, 1916, Dobuts. Z. (Zool. Mag.) Tokyo, xxviii. p. 257 (in Japanese).

Loc.	T.L.	H.	M.	P.	P.D.	P.A.	V.
Off Enoshima, Japan (incl. type of *S. affinis*)—8 spec.	364 to 679	12·95 to 14·4	6·7 to 7·8	5·7 to 7·2	27 to 33·42	27 to 31·3	135 to 137
Hawaiian Is. (holotype of *S. brachysomus*).	708	14·6	—	6·21	29	27·54	135

This form, which is perhaps confined to the North Pacific, may be distinguished from *S. kaupii* by the lower number of vertebræ, rather longer head and pectoral fin, and somewhat more anterior insertion of dorsal fin. If specimens of equal size are compared the eye seems to be a little smaller in *S. affinis*.

The following example, obtained by the 'Challenger' off the coast of Brazil, may belong here. It agrees with the specimens listed above in the pre-dorsal length,

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* Measured on the two sides of the fish.

length of pectoral, as well as in the number of vertebræ, but in the short head approaches *S. kaupii.*

Loc.	T.L.	H.	M.	P.	P.D.	P.A.	V.
Off Brazil	467	12·2	7·1	5·8	29·1	30·2	138

4. *Synaphobranchus indicus* Bruun ?

Synaphobranchus pinnatus (part), Günther, 1887, Deep-Sea Fish. 'Challenger,' p. 253.
? *Synaphobranchus indicus* Bruun, 1937, 'Dana' Report, no. 9, p. 14.

Loc.	T.L.	H.	M.	P.	P.D.	P.A.	V.
Off Philippines—2 spec.	394 to 548	14 to 14·2	7·6 to 7·8	5·8 to 6·1	25·95 to 27·4	25·95 to 27·4	131 to 132

This form is very close to *S. affinis*, differing only in the more anterior origins of the dorsal and anal fins and the somewhat smaller number of vertebræ.

It is possible that the larval forms from the eastern Indian Ocean, with 129 to 133 myomeres, described by Bruun as *S. indicus indicus*, may belong here.

5. *Synaphobranchus jenkinsi* Jordan & Snyder.

Synaphobranchus brevidorsalis (part), Günther, 1887, Deep-Sea Fish. 'Challenger,' p. 255.
Synaphobranchus jenkinsi Jordan & Snyder, 1901, Proc. U.S. Nat. Mus. xxiii. p. 845, fig. 2.

Loc.	T.L.	H.	M.	P.	P.D.	P.A.	V.
Hyalonema ground off Japan (one of the types of *S. brevidorsalis*).	451	13·3	6·6	5·8	40·8	29	134
Off Enoshima, Japan (holotype).	419	13·25	—	5 to 5·25	38·2	28·16	132

This form, known only from Japan, differs from *S. affinis* in having the origin of the dorsal fin farther back, and also in the rounded form of the scales (fig. 1, B).

6. *Synaphobranchus brevidorsalis* Günther.

Synaphobranchus brevidorsalis (part), Günther, 1887, *t. c.* p. 255, pl. lxiii. fig. C.

Loc.	T.L.	H.	M.	P.	P.D.	P.A.	V.
North of New Guinea (type of the speces).	596	13·1	6·7	4·7	46·6	34·1	128

This form possesses scales of the same type as those of *S. jenkinsi*, but differs in the more posterior positions of the origins of the dorsal and anal fins, the shorter pectoral fin, and the somewhat fewer vertebræ. The larval forms described by Bruun * as *Leptocephalus synaphobranchus sului*, from the Sulu Sea, may belong here. These larvæ have 124 to 129 myomeres.

Subgenus HISTIOBRANCHUS.

1. *Synaphobranchus infernalis* Gill.

1883, Proc. U.S. Nat. Mus. vi. p. 255.

Loc.	T.L.	H.	M.	P.	P.D.	P.A.	V.
Atlantic [after Bruun]—9 spec.	126 to 900	9·4 to 13·2	9·1 to 9·2	3·1 to 3·9	13·5 to 15·4	40·5 to 45·9	[125]126 to 134

This species, which appears to be confined to the Atlantic, is not represented in the British Museum collection. Bruun † gives the range in the number of myomeres in the larvæ as 131 to 140.

2. *Synaphobranchus bathybius* Günther.

Synaphobranchus bathybius (part), Günther, 1877, Ann. & Mag. Nat. Hist. (4) xx. p. 445.

Loc.	T.L.	H.	M.	P.	P.D.	P.A.	V.
North Pacific—5 spec.‡	368 to 618	11·8 to 13·7	7·8 to 8·8	3·3 to 3·8	13·9 to 16·3	44·9 to 47·6	131 to 140

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* 1937, 'Dana' Report, no. 9, p. 13.

† *T. c.* p. 5.

‡ The specimen from Station 246, figured by Günther, may be regarded as the type.

This form is very closely related to *S. infernalis*, but has a somewhat smaller mouth, and the origins of the dorsal and anal fins are a little farther back.

3. *Synaphobranchus australis* Regan.

Synaphobranchus bathybius (part), Günther, 1877, *t. c.* p. 445.
Synaphobranchus australis Regan, 1913, Trans. R. Soc. Edinburgh, xlix. p. 235, pl. viii. fig. 5.

Loc.	T.L.	H.	M.	P.	P.D.	P.A.	V.
S. Indian Ocean (holotype).	357	14·3	8·2	3·6	20·4	47·6	130

Very close to the two preceding forms, but with a slightly larger head and the origin of the dorsal fin farther back.

Genus DIASTOBRANCHUS.

1. *Diastobranchus capensis* Barnard.

1923, Ann. S. Afric. Mus. xiii. p. 441.

Loc.	T.L.	H.	M.	P.	P.D.	P.A.	V.
Off Cape Point (co-type).	270	12·6	7·6	7	[29·6]	20·37	169

The giant larval form (172 mm.) from west of New Zealand, described by Bruun * as *Synaphobranchus danæ*, with 172 myomeres, may perhaps be the young of Barnard's species.

XLI.—*Descriptions and Records of Bees.*—CLXXIII.

By T. D. A. COCKERELL, University of Colorado.

THE bees described or recorded in this part belong to the British Museum.

Cœlioxys nyasica, sp. n.

♀.—Length 13 mm.

Black, including mandibles, antennæ, tegulæ, and legs, but apical margin of first abdominal sternite red; eyes reddish brown, with rather long hair; pubescence white, dense on sides of face, thin on clypeus, but lower margin of clypeus has a long dense slightly creamy beard; cheeks with dense white hair; pleura and sides of metathorax with copious white hair, but mesonotum without evident hair-marks; there is a thin line of white hair above tegulæ, and a band, interrupted in middle, at base of scutellum; tergites with slender hair-bands, broadened as usual at sides, apex with white hair at sides, venter with a longitudinal band in middle of first sternite, a broadly interrupted band on second, a more narrowly interrupted one on third, a nearly entire one on fourth, and fifth with a white marginal band, forming a V; clypeus with no keel, but a shining keel between antennæ; front dull; no keels at sides of front ocellus; a shining band across vertex; mesonotum dullish, very coarsely punctured; scutellum cancellate, not at all produced apically; axillæ with long spines; area of metathorax entirely dull; wings dilute fuliginous, pale at base; spurs pale reddish; inner side of basitarsi with yellowish hair; abdomen shining, strongly but not densely punctured, the tergites with the usual transverse sulci; tergites 2 to 4 are punctured almost alike; last tergite produced to a beak-like but obtuse point and keeled its whole length; last sternite rather broad, going a short distance beyond tergite, apically truncate and bidentate; fifth sternite punctured nearly as fourth.

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* 1937, *t. c.* p. 13, pl. 1, figs. 1 & 3.

Nyasaland: Mlanje, 2300 ft., Oct. 8, 1913 (*S. A. Neave*).

Related to *C. congensis* Friese, but differs in the sculpture of the abdomen. The end of the abdomen is much broader than in *C. argentea* Lep., and it lacks the lateral fringes of brown hair present in *C. trimerura* Ckll.

Cœlioxys trimerura Cockerell.

Cape Province: Ceres, Nov. 1920 (*R. E. Turner*), ♀.

Differs from the type (from Nairobi) by the entirely reddish-brown tegulæ, lack of evident light hair at base of scutellum, lack of pale hair in sulci on second and third tergites, and ventral segments of abdomen reddened in middle. It seems probable that *C. trimerura* and *C cæruleipennis* Friese are races of one species, and in that case the Ceres insect may represent a third race. It is, however, nearest to *C. trimerura*, from which I cannot well separate it.

Cœlioxys congoënsis Friese.

N. Rhodesia: road to Nangereri, Feb. 6, 1910 (*Silverlock*).

The two little points at end of abdomen (♀) are much smaller and closer together than in *C. emarginata* Foerst. The hair of the eyes is very short. I at first sorted out a male (N. Rhodesia, Algoa, May 3, 1910, *Silverlock*) to go with this, but it is the species I recognize as *C. somalina* Magr. The wings are not nearly so dark as in *C. congoënsis*.

Cœlioxys demeter, sp. n.

♀.—Length about 12·5 mm., width of abdomen 3·4, length of anterior wing 7·5.

Rather slender, black, including antennæ (flagellum quite long, over 3 mm.), but mandibles red except the tridentate end, tegulæ copper-red, legs bright red (coxæ black, the front pair with sharp spines); facial quadrangle longer than broad; face and clypeus densely covered with long dull white hair, the clypeal fringe slightly yellowish; no frontal keel; a shining space in front of middle ocellus; vertex very coarsely punctured; underside of head with a pair of prominent spines; cheeks and sides of thorax with long white hair; eyes with rather long hair; mesonotum and scutellum strongly and very densely punctured, the punctures running in lines; no hair-marks on thorax above except a rather weak band above tegulæ and a feeble band along front of scutellum; scutellum short, the margin gently rounded; spines of axillæ short. Wings hyaline, the margin dilute brownish; basal nervure falling short of nervulus; first recurrent nervure much more distant from base of second cubital cell than second from apex; spurs red. Abdomen shining, first two tergites strongly punctured dorsally, the others more weakly and sparsely; shining sulci on second and third tergites continued across the middle; apical tergite beak-like, obtusely pointed, with a slender keel; apical sternite narrow but not linear, extending far beyond tergite, sharply pointed, not fringed at sides, each side with a minute notch, only clearly seen under the microscope; abdominal hair-bands slender, white, only moderately broadened at sides, sixth tergite with an elongate hair-spot on each side, and white hair at sides of base; venter with white hair-bands, and the margins of the segments reddened; punctures on fourth and fifth sternites minute and sparse, on second and third strong, on second smaller and denser anteriorly.

Cape Province: Ceres, Dec. 1924 (*R. E. Turner*).

This has much the aspect of *C. willowmorensis* Brauns, which has black femora, and the end of the abdomen different. It is smaller than *C. chubbi* Ckll., with the wings not so dark, and the last sternite more slender apically.

Cœlioxys neli Cockerell.

Cape Province: New England, Dec. 21, 1923 (*R. J. Nel*).

Cœlioxys lucidicauda, sp. n.

♀.—Length about 9 mm.

Like *C. neli*, but differing thus:—Head shorter; mandibles red, except the apical teeth; head and thorax not so hairy; scutellum shorter; middle of tegulæ bright copper-red; nervures more slender; second recurrent more distant from end of second cubital cell; femora black, but tibiæ and tarsi bright red; last tergite highly polished (dull in *C. neli*), with a deep long fovea on each side of apical part; last sternite more slender; fifth sternite with the pointed end bright red.

Cape Province: Matjesfontein, Oct. 1928 (*R. E. Turner*).

I thought at first to treat this as a subspecies of *C. neli*, but there are too many differences. Seeking a male for this species, I picked out a species represented by one specimen from Matjesfontein, Nov. 1928 (*Turner*), and three from the Little Karroo, 38 miles east of Ceres, Nov. 1924 (*Turner*), but I do not feel at all certain that the association is correct. This male is very like *C. spilaspis* Ckll., with which it agrees in having only the marginal bands on the tergites. But it has red femora as well as tibiæ and tarsi, and the lateral teeth of sixth tergite are red. The tegulæ are black or nearly so, as in *C. spilaspis*. The female of *C. spilaspis* is very different from that of *C. lucidicauda*.

Cœlioxys caffra Friese.

Pondoland: Port St. John, Jan. 1924 (*R. E. Turner*), ♀. End of abdomen reddish; tegulæ red; abdominal bands much narrower at sides than in *C. capensis* Smith.

Halictus (*Seladonia*) *banalianus* Strand.

Belgian Congo: Sakania, Sept. 1931 (*W. P. Cockerell, J. Ogilvie, A. Mackie*); Kabalo, 1 ♂, Aug. 15 (*J. Ogilvie*).

Halictus centrosus Vachal.

Belgian Congo: Sakania, Sept. 1931, 1 ♀ (*L. Ogilvie*).

This seems to be Vachal's species, described from the same general region. Unfortunately the abdomen has been wetted, and the banding, if any, is not evident; there is certainly no apical band on first tergite or basal one on second; the abdomen is broad, black, with the first tergite green, as Vachal describes. The supraclypeal area is prominent and the basal area of metathorax is very large, triangular, finely plicatulate at base, as Vachal states. The tibiæ are darker than Vachal's description would suggest.

Halictus hotoni Vachal.

S. Rhodesia: Matopo Hills, April–May 1932, 3 ♂ (*C. P. Harvey, L. Ogilvie*).

I take these to be the male of *H. hotoni*, distinguished by the very clear hyaline wings and the white pubescence. There are, however, two females of *H. banalianus* from the Matopo Hills, May 1 (*C. P. Harvey*). The presumed *H. hotoni* male is very close to *H. capensis* Friese.

Halictus parvulinus, sp. n.

♂.—Length 5 mm.

Black, with little pubescence; face with appressed white hair, not hiding the clypeus; thorax above with thin erect white hair, only noticed in lateral view; abdomen thinly hairy, without bands or spots; head broad, orbits converging below; clypeus projecting, its margin yellow, as also labrum, and mandibles except base; front and vertex dull, very black; flagellum long, robust, dusky red beneath; mesonotum dullish, very finely punctured, moderately shining on disc, median groove distinct; scutellum shining; area of metathorax semilunar, dull, with a shining margin; tegulæ very dark brown, almost black. Wings hyaline, faintly greyish; stigma large, dark red, with a darker margin; nervures dark brown, outer nervures not weakened; third cubital cell short, receiving second recurrent nervure far from end; second cubital cell about as long on first discoidal as third on third, receiving first recurrent nervure at its apical corner. Legs black, with dull whitish tarsi, anterior tibiæ reddish in front. Abdomen rather robust, polished, constricted at end of first tergite, the broad apical depressions of tergites strongly marked. Microscopical characters: mesonotum minutely lineolate between the irregularly placed punctures; area of metathorax with rugæ forming an irregular network; tergites with very fine but very distinct and numerous punctures, the transversely lineolate depressions brownish; the first three tergites are punctured alike.

The Sea Point specimen is smaller (4·5 mm.), with the flagellum clay-coloured beneath and the tarsi dark, though the tibiæ show a light spot at base and apex. The pale appearance of the tarsi of the type is partly due to silvery-white pubescence on the inner side.

Cape Town: Table Mountain (type-locality), Jan. 1932 (*A. Mackie*); Sea Point (*J. Ogilvie*).

Related to some of the small males described by Cameron, but *H. collegus* Cam. has red tegulæ and *H. thestis* Cam. has yellow basitarsi. The shining scutellum contrasting with the duller mesonotum is distinctive.

Halictus (*Evylæus*) *mirifrons*, sp. n.

♀.—Length about 7 mm., anterior wing 5·2.

Black, robust, with broad abdomen, its width about 2·5 mm.; hair of head and thorax long but thin, greyish white; abdomen with broad bands of greyish-white tomentum at lateral bases of tergites 2 to 4, sides of apex with long white hair; head broad, approximately circular seen from in front, the clypeus little projecting; mandibles, antennæ, and tegulæ black; labrum covered with silky pale hair; clypeus with the lower part shining, and a depression in the middle; under the microscope, with an oblique light, the long hairs overlapping the labrum appear golden, and the clypeus shows a golden surface, thickly beset with large punctures, except the lower lateral corners (just meeting in middle), which are abruptly black, without the punctures; when the clypeus is seen from another angle the surface appears intense black, not golden; front dull, a little shining next to orbits; vertex with polished marks bordering the group of ocelli; mesothorax very densely punctured at sides, more sparsely on disc, which is conspicuously shining, as is the scutellum, the latter with a dull median line; area of metathorax not very long, but longer than postscutellum, under lens appearing entirely dull, without evident sculpture; the microscope shows very fine rugulose sculpture all over; long hairs on hind part of metathorax conspicuously plumose; posterior truncation not sharply margined. Wings strongly greyish, not at all reddish; stigma very dark brown; nervures very dark, except that the outer recurrent and intercubitus are evanescent; second cubital cell large, receiving recurrent nervure at apical corner; third cubital strongly bulging outward. Legs black, with pale hair, the brush at end of hind basitarsi bright copper colour; spurs red, hind spur with many small teeth, as in *H. matoporum* Ckll. Abdomen shining, with rather long straight white hairs beneath.

Belgian Congo (Katanga): Dilolo, July 24–27, 1931 (*J. Ogilvie*).

Easily known from *H. michaelseni* Friese, which has the broad abdomen, by the dusky wings and black tegulæ; from *H. matoporum* Ckll. by the smaller size and lack of dense tomentum on postscutellum; from *H. creightoni* Ckll. by the shining mesonotum; from *H. mesopolitus* Ckll. by lacking the polished bands at sides of front and having the outer wing-nervures very weak; from *H. rubritarsis* Ckll. by the very weak sculpture of area of metathorax.

Halictus leucophenax, sp. n.

♀.—Length about 10 mm.; wings 6·6 mm., short for size of insect.

Black, including mandibles and antennæ, the apical part of flagellum very faintly reddish beneath; tegulæ red, with a dark spot anteriorly; hair of head and thorax pure white, long and dense on sides of face, very long on mesopleura; hair of legs white; abdomen with pure white hair-bands, first tergite with white hair at sides, but no apical band, second with broad basal and apical bands, connected at sides, not extending across middle but forming C-like marks; third and fourth tergites with entire even apical and basal bands, caudal fimbria bordered with white hair; venter with hair-bands, collecting some pollen; head broad; clypeus short, convex, polished, the base dull; front dull, but vertex shining; mesonotum and scutellum polished, with fine punctures; scutellum with a dull median depression; area of metathorax about as large as postscutellum, truncate behind, dull, under the microscope appearing uniformly rugulose or pitted all over (quite without plicæ), the edges of the depressions shining; posterior truncation dull, with long hair. Wings clear hyaline, with red stigma, which is not dark-margined; nervures pale brown, outer recurrent and intercubitus greatly weakened; second cubital cell very broad, first recurrent nervure meeting intercubitus. Legs black; hind spur with many small teeth, as in *H. deceptus* Sm. and *H. matoporum* Ckll. Abdomen rather dull.

S.W. Africa: Omaruru, Jan. 1934 (*L. Ogilvie*).

This is a desert representative of *H. deceptus* Smith which has dusky wings and black tegulæ. It ought apparently to be *H. duplocinctus* Friese (not Vachal, 1902), which came from Okahandja, about 70 miles away, but that is smaller, with the caudal fimbria reddish, and appears to be *H. deceptus*, as Blüthgen has asserted on examining the type.

Halictus rhodaspis Cockerell.

Orange Free State: Bosrand, Afdeling Farm, 2 ♀♀, March 30, 1934 (*J. Ogilvie*).

The sculpture of the area of metathorax is exactly as in *H. leucophenax*. The species was described from Natal.

Halictus placatus Cockerell.

Belgian Congo: Albertville, Sept. 1 (*L. Ogilvie*); Dilolo, July 24–27 (*J. Ogilvie*).

S. Rhodesia: Matopo Hills, April (*J. Ogilvie*); Christmas Pass, Umtali, May (*J. Ogilvie*).

Transvaal: Louis Trichardt, April (*A. Mackie, J. Ogilvie*).

Natal: Ingogo, March (*A. Mackie*).

These are females. I could hardly believe that these were all one species, but I do not know how to separate them. They can readily be divided into two groups, one with practically black tegulæ, as in the type, the other with strongly reddened tegulæ. The latter group includes the specimens from Albertville and Umtali, but both kinds come from Louis Trichardt and the Matopo Hills. The Dilolo specimen has the head narrower and more oval than usual, but there is not enough difference to suggest a distinct species. Distinctive characters are the dark stigma and dark hind tibiæ; the very similar *H. shanganiensis recessus* Ckll. from Dilolo has the stigma clear red and the hind tibiæ red. *H. matoporum kafubuensis* Ckll., also from Dilolo, has a conspicuously shorter area of metathorax and the hind spur differs. The Albertville specimen of *H. placatus* may represent a distinct race, but I cannot define it satisfactorily without more material.

Halictus trichardti, sp. n.

♀.—Length about 8·5 mm., anterior wing 6·5.

Black, including mandibles (a little reddish in middle) and antennæ, but tegulæ dark chestnut-red and hind tibiæ and tarsi clear red, except that the basitarsi have a large blackish stain on apical half; head and thorax hoary with long greyish-white hair, nowhere reddish; clypeus little produced, shining, coarsely punctured, with a strong median depression; supraclypeal area shining but well punctured; front dull, feebly shining along orbits; vertex dull, with a shining outer border to lateral ocelli; scape (seen under microscope) finely rugose, with a tessellate surface and small punctures; mesonotum entirely dull, with very fine dense punctures; scutellum shining, moderately bigibbous, with a dull median line; postscutellum with dense greyish-white tomentum; area of metathorax rather large, coarsely rugose with wrinkled plicæ, the middle ones conspicuously vermiform; posterior truncation dull. Wings hyaline, slightly greyish; stigma dusky red; nervures pale brown, outer recurrent and intercubitus very pale; second cubital cell very broad, receiving recurrent nervure near end. Legs with pale hair, orange on inner side of basitarsi, white on hind tibiæ; hind spur without teeth, the end strongly bent. Abdomen moderately shining; a large patch of pale tomentum at each side of first tergite; second and third tergites with broad entire white hair-bands at base, third also with a narrower apical band, fourth with an apical band, hair at apex pale, faintly tinged with brownish; venter with three reddish-orange tegumentary bands.

Transvaal: Louis Trichardt, April 4–10, 1932 (*J. Ogilvie*).

Very similar to *H. shanganiensis recessus* Ckll., but easily distinguished by the dull mesonotum and different hind spur. It may also be compared with *H. postpictus* Ckll., which differs in similar ways, and also in the abdomen. The area of metathorax is much more coarsely sculptured than in *H. s. recessus*. The locality is 3112 ft. above sea-level.

Halictus acaciæ, sp. n.

♀.—Length about 7·5 mm., anterior wing 6.

Black, including mandibles (faintly reddish apically) and antennæ (flagellum very obscurely brownish beneath), but tegulæ red and hind legs with apex of tibiæ broadly, and basal two-fifths of basitarsi, clear red; head rather broad, orbits converging below; clypeus appearing slightly greenish, shining, with scattered strong punctures, the lower margin black; head with thin but conspicuous greyish-white hair; no shining band along orbits; vertex dull; thorax with thin greyish-white hair; mesonotum dull, with excessively dense confluent punctures all over; scutellum slightly bigibbous, the elevations shining; area of metathorax large, densely covered with shining pits (style of *H. leucophenax*); posterior truncation sharply margined, its upper part shining. Wings dilute reddish; stigma pale dull orange-fulvous; nervures rather pale; second cubital cell broad, receiving recurrent nervure near end; third cubital cell not produced apically, its sides nearly parallel; marginal cell pointed at end. Legs with pale hair; hind spur bent at end and without teeth (style of *H. trichardti*). Abdomen dullish, broad; first tergite with long hair at base and sides, but no definite patches of tomentum; second and third with broad bands of faintly fulvescent tomentum at base, third and fourth with broad apical bands of pale grey tomentum; apex reddish; venter with bands of erect hair.

Orange Free State: Gum Tree, Feb. 29, 1932 (*J. Ogilvie*).

By the characters of the spurs and the area of metathorax this closely resembles the much larger European *H. scabiosæ*, and no doubt they belong to the same group. From the African *H. placatus* it is known by the hind spur and other characters; *H. michaelseni* Friese is larger and different in several respects.

Halictus levisculptus, sp. n.

♀.—Length 8·5 mm., anterior wing 5·8.

Black, including mandibles, antennæ (flagellum very faintly reddish apically), and legs (tarsi red at end); tegulæ brown, strongly shining on disc; hair of head long, rather dull white, but on thorax above it is pale fulvous; head broad; clypeus not prominent, shining black, with scattered strong punctures and a median groove; supraclypeal area dull; front dull, somewhat shining along orbits; mesonotum and scutellum entirely dull, the mesonotum minutely rugulose, with a microscopically tessellate surface, the small punctures indistinct; postscutellum without dense tomentum; area of metathorax large, dull, microscopically reticulate all over. Wings strongly dusky; stigma fulvous, nervures pale; second cubital cell small, receiving recurrent nervure well before the end; third cubital cell broad, about or nearly twice as large as second. Legs with slightly fulvescent hair; hind spur with four long spines (style of *H. claricinctus*). Abdomen broad, somewhat shining, the margins of the tergites pallid, with well-developed apical hair-bands on tergites 3 and 4, on the first two they are more or less developed at sides; no basal bands; hair at apex not reddened; venter with bands of long silvery-white hair.

S. Rhodesia: Vumbu, Umtali, May 23–26, 1932 (*J. Ogilvie*).

In my table this runs near *H. calviniensis*, from which it is easily separated by the abdominal bands and colour of pubescence. In my preliminary sorting of the specimens this species and *H. acaciæ* fell close together, owing to their general similarity, especially in the dull mesonotum. But critical examination shows that they belong to quite different sections of the genus.

XLII.—*New and rare Species of Aquatic Coleoptera from New Caledonia.*—Dytiscidæ *and* Palpicornia. By J. Balfour-Browne, M.A., F.Z.S., F.R.E.S., British Museum (Natural History).

Dytiscidæ.

Necterosoma novæ-caledoniæ, sp. n.

Ovalis, haud latus, brevissime pubescens, densissime punctatus, opacus, niger; antennis rufis; tarsis, præcipue anticis, rufo-fuscis; capite angusto, antice nonnullo, postice crebre densissime punctato; prothorace densissime, in medio crassiore, crebre punctato; elytris omnino densissime subtiliter punctatis; subtus omnino densissime ruguloso punctato.

Long. 4·5 mm.; lat. 2·5 mm.

New Caledonia: Mt. Panié, 1914, ♂ holotype, ♀ allotype, 2 ♂♂, 3 ♀♀ paratypes (*P. D. Montague* leg.).

In the male the anterior tibiæ have a moderately deep notch and angulation in the middle of the lower edge; the basal three segments of the protarsi are rather strongly dilated, the fourth is rather conspicuous, the fifth elongate; the mesotibiæ are considerably curved.

In the female the basal three segments of the protarsi are about as wide as long, the fourth very short, the fifth short, only about twice as long as the fourth segment. The pro- and mesotibiæ of the female are quite straight.

The species is readily distinguished by the colour, which is unrelieved black. It appears to be most nearly related to *N. schmeltzei* Sharp. It is the first species to be recorded from outside the boundaries of Australia and Tasmania.

Rantus marmoratus (Perroud).

Colymbetes marmoratus Perroud, 1864, Ann. Soc. linn. Lyon, ii. p. 77.
Rhantus marmoratus Fauvel, 1883, Rev. d'Ent. ii. p. 342.

Two males, one from Ignambi, 4000 ft., 2. ix. 1914, the second from Paompaï (Pampai), 16. ix. 1914 (both *P. D. Montague* leg.), undoubtedly belong to this species. The extremely fine and barely visible reticulation—a feature unique in the genus to the best of my knowledge—renders the species easily distinguishable. The two specimens are very different in size and form; the first being elongate-oval, not at all parallel, and quite evenly attenuated to the apex, measures 11·68 × 6·0 mm. The second specimen is markedly parallel-sided, the apices of the elytra much more sharply attenuated, with the elytral apices rounded, and measures 13·54 × 6·77 mm.

The basal three segments of the anterior and intermediate tarsi are moderately dilated and furnished beneath with a dense pad of adhesive hairs; the anterior tarsal claws are simple and alike, not very strongly curved, and rather weak for so large an insect. The elytral colour-pattern is variable, as described by Fauvel; in the Paompaï specimen the basal and apical red patches are quite separate, not very much invaded by the black irrorations; the Ignambi specimen has the elytra largely red with black irrorations which coalesce at the disc to form a black patch on the suture.

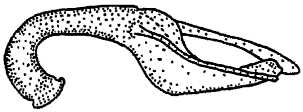
Palpicornia.

Hydræna (s. str.) *densa* Fauvel.

Hydræna densa Fauvel, 1883, Rev. d'Ent. ii. p. 350.

A single specimen, a male, from Houadou, New Caledonia, 24. x. 1914 (*P. D. Montague* leg.), appears to belong here, answering tolerably well to the description. In order that the species may be better characterized I propose to add certain characters which modern practice makes use of.

Fig. 1.



Hydræna (s. str.) *densa* Fauvel. Ædeagus from the left side.

The labrum is not very deeply emarginate in the middle and the mentum is finely but remotely punctulate, finely reticulate only at the sides, the disc shining. The metasternum is without paired glabrous patches just in front of the metacoxæ. The fifth abdominal sternum is shining, with hydrofugal pubescence only as a narrow strip at the base; the sixth sternum is quite glabrous, shining, the centre of the apical margin slightly produced into a rounded lobe; the seventh sternum is rather prominently visible. The ædeagus is not very complex, the parameres asymmetrical, the right fairly strong, the left quite thin and thread-like (fig. 1).

At about four-fifths of the length of the elytron the fifth interstria appears to form a very small rounded carina. From the suture to this carina the elytron is flat, but from the carina to the explanate margin the surface slopes sharply and is not at all rounded, so that in transverse section the elytron at this level appears to be angled like the corner of a roof.

In the elongate form and the peculiar elytral contour the species is very distinct from all Australasian species known to me. It has no relationship with *H. princeps* Fauvel, the only other member of the genus so far recorded from New Caledonia.

Dactylosternum montaguei, sp. n.

Ovalis, convexus, niger, alutaceus ; capite transverso, sat subtile sat dense punctulato, omnino alutaceo, antice crassiore, postice tenuiore, oculis rotundatis, haud reniformibus, parvis ; antennis novem-articulatis, clavâ laxe articulatâ ; thorace sat brevi, antice profunde bisinuato, antice tenuiter, ad latera magis distincte marginato, angulis anticis rotundatis, posticis subrectis, quam capite paulo fortiore punctulato, alutaceo ; elytris tenuiter alutaceis, decem-seriatim punctatis, seriebus postice lateribusque profunde canaliculatis, interstriis internis sat planis, externis sat convexis, seriebus duabus internis antice circiter ad medium haud striiformibus ; subtus mento profunde excavato, antice emarginato, ad latera sat crebre punctato, omnino reticulato, opaco ; prosterno distincte carinato, antice fortiter dentato ; parte elevatâ metasternali sat tenuiter irregulariter parce punctulatâ ; femoribus posterioribus punctis setigeris remotis.

Long. 4·12–4·43 mm. ; lat. 2·23–2·53 mm.

New Caledonia : Mt. Arago, 18. vii. 1914, holotype ; Hienghene (no date), 7 paratypes (*P. D. Montague* leg.).

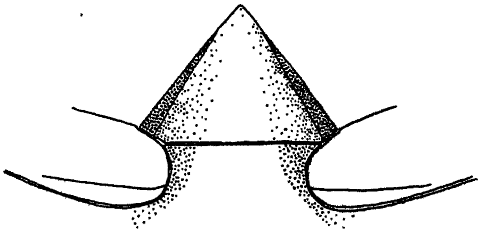
This very distinct species, although alutaceous, does not appear to be related to *D. auripes* Fauvel or *D. helleri* d'Orchymont, both from New Caledonia, since the form is definitely oval, not subhemispherical. The elytral series deeply incised laterally and posteriorly, the metasternal tabella widened posteriorly (appearing like the longitudinal section of a Chianti flask), and the alutaceous dorsal sculpture together provide easy distinguishing characters from all the other species recorded from these islands. The tarsi are very short, the four anterior provided with a sparse longish silvery pubescence beneath.

The holotype, I think a female, is the only specimen in a good state of preservation.

Genus KANALA, nov.

Corpus elliptico-ovale, breviter pubescente, sat convexum; antennis novem-articulatis; mento leviter antice emarginato, tenuiter excavato, remote punctato; prothorace postice serie punctorum magnorum haud munito; prosterno plus minusve longitudinaliter carinato, antice dentato; elytris decem-seriatim punctatis; mesosterno parte elevatâ plus minusve late æqualiter triangulatâ, in medio levissime tectiformi, basi recto; mesocoxis sat late separatis; metasterno parte elevatâ aream tabellam formante, antice inter mesocoxæ leviter producto; femoribus intermediis posticisque glabris, margine anteriore posteriorum leviter curvato; pedibus longis, tarsis sat longis, subtus pilosis; abdominis segmento basali longitudinaliter carinato.

Fig. 2.



Kanala reticulata, gen. et sp. n. Mesosternal lamella.

Genotype: *Kanala reticulata*, sp. n.

The position of this genus is in the Cercyonini, on the following characters:—(i.) Fronto-clypeus sharply narrowed in front of the eyes, which are not emarginate; (ii.) antennæ longish, the insertion visible from above; (iii.) metasternum sending an anterior projection between the mesocoxæ; (iv.) the metathoracic episterna are not wide, but are not at all covered by the elytra when the insect is at rest.

There is, however, an approach to the Megasternini in the rather flattened mesosternal process, which is triangular (fig. 2), the relatively widely separated mesocoxæ, and the prosternum raised into a carinated elevation just in front of the procoxæ. The genus appears to be endemic to New Caledonia, where it is represented by two new species described below.

Kanala reticulata, sp. n.

Elliptico-ovalis, postice attenuatus, convexus, haud explanatus, nitidulus; capite antice rufo, postice fusco, sat dense regulariter punctulato; pronoto brevi, fusco-rufo vel nigro, utrinque ad basin foveâ minutâ impressâ, ut in capite punctulato; elytris decem-seriatim punctatis, postice et ad latera profunde canaliculatis, striiformibus, interstriis antice sat planis, postice convexis, reticulatis, areolis sat grandis, punctulo tenue in singuli areolam; subtus mento opaco, reticulato, obsolete punctulato; prosterno leviter carinato, antice fortiter dentato; mesosterni parte elevatâ sat remote punctulatâ, lævigatâ; metasterno antice inter mesocoxæ recto, cum basi mesosterni intime conjuncto, parte elevatâ lævigatâ, irregulariter sat dense punctulatâ, utrinque ante coxæ foveâ tenue impressâ.

New Caledonia: Mt. Ignambi, 2. ix. 1914, holotype ♂, 2 ♂♂ paratypes; Mt. Panié, 1914, allotype ♀ (*P. D. Montague* leg.).

This species is remarkable by the form of the elytral reticulation, and is quite unlike any other species known to me.

Kanala montaguei, sp. n.

Ovalis, postice leviter attenuatus, convexus, haud explanatus, niger, nitidus; capite antice late fusco-rufo, postice nigro, sat remote punctulato, punctulis bene impressis; pronoto nigro, ad latera angustule rufo-flavo, ut in capite punctulato, utrinque ad basin foveâ minutâ vix perspicue impressâ; elytris decem-seriatim striatis, postice lateribusque sat profunde canaliculatis, interstriis sat remote punctulatis, quattuor internis usque ad medium fere planis, postice et interstriis externis sat convexis, nigris, maculis duabus ad basin (externo humerali, interno inter striis quarta quintaque), maculâ parvâ subapicali, rufo-flavis; subtus mento lævigato, sat remote distincte punctulato, antice profunde foveolato, leviter emarginato; processu prosternali carinato; laminâ mesosternali sat angustâ, tenuissime punctulatâ; metasterno antice inter mesocoxæ recto, cum basi mesosterni minus intime conjuncto, tabellâ lævigatâ regulariter sat remote punctulatâ, utrinque ante coxæ plagâ parvâ impunctulatâ, nullo modo foveolato Long. 2·55–2·74 mm.; lat. 1·54–1·59 mm.

New Caledonia: Paompaï (Pampai), 14. iv. 1914, holotype and 2 co-types (sex undetermined) (*P. D. Montague* leg.).

This little species bears some resemblance to *Notocercyon dorsale* (Erichson) in the colour-pattern, but it is much broader, more attenuate behind, and more shining. The mesosternal lamina is much narrower than in *K. reticulata*, not so visibly triangular, the more flattened portion being barely broader behind, and the suture with the anterior projection of the metasternum being much less intimate than in that species.

Genus LIMNOCYCLUS, nov.

Generis *Limnoxeno* et *Hydrocyclo* valde affinis. Elongatus, sat parallelus, sat convexus, nigro-micans; capite, clypeo lato, angulis anticis fere rectis, oculis sat grandis, proeminentibus, antennis novem-articulatis, clavâ laxe articulatâ, palpis maxillaribus quam antennis brevioribus, articulo quarto quam tertio fere duplo longiore; pronoto brevi, transverso, sine seriebus punctorum systematicorum perspicuis; elytris fortiter decem-seriatim punctatis, serie juxtascutellare brevi aditus; subtus mento densissime fortiterque punctato, antice rotundato, haud emarginato; prosterno ante coxæ sat longe, rugoso, vix longitudinaliter carinato; mesosterni processu parvo elevato, antice cultriforme, postice subexcavato; metasterno ut in genero *Limnoxeno*; pedibus longis tenuisque, haud natatoribus, tarsis posterioribus supra ciliatis, subtus haud pubescentibus.

This new genus approaches rather closely to *Limnoxenus* in certain characters, resembling it in the form of the metasternum and legs and having a mesosternal lamina of the same type. In the form of the head and dorsal surface the genus is very close to *Hydrocyclus*. In my opinion the genus should be placed between *Limnoxenus* and *Hydrocyclus*; from the first part of the former name and the second part of the latter I have formed the name of the new genus, which comprises a single new species, which is therefore the genotype, described below.

Limnocyclus puncticeps, sp. n.

Capite (labro transverso, antice recto), antice lato, angulis anticis clypei fere rectis, margine anteriore levissime emarginato; sat dense duplo punctato, aliis grandis, aliis minutis; pronoto ut in capite punctato, punctis grandis præcipue ad latera, ad discum magis remote, lateribus leviter rotundatis, tenuiter marginatis; elytris elongatis, seriebus punctorum magnorum antice vix, postice tenuiter striiformibus, interstriis tenuissime remote punctulatis; subtus densissime rugoso punctato, segmento ultimo abdominis tenuiter emarginato; meso- et metafemoribus subtus ad basin haud pubescentibus, punctis setigeris remotis instructis. Mas ignotus.

Long. 8·78 mm.; lat. 3·84 mm.

New Caledonia: Paompaï (Pampai), 15. ix. 1914, holotype ♀ (unique) (*P. D. Montague* leg.).

This unique is so distinctive in appearance that I have no hesitation in erecting a new genus to receive it. As stated after the generic diagnosis the dorsal aspect has a great affinity with *Hydrocyclus*, but the generic characters show a greater affinity with *Limnoxenus*.

XLIII.—*On the Anthidiine Bees of Hissar Mountains (Tadzhikistan)*. By G. A. Mavromoustakis, Limassol, Cyprus.

To Mr. V. Gussakovskij, Zoological Institute, Academy of Sciences, Leningrad, I am indebted for his kindness in sending me the following very interesting material of Anthidiinæ, collected by him from Hissar Mountains during the summer and September 1937. Mr. Gussakovskij has collected Anthidiinæ in the southern part of Hissar Mountains, 30–40 km. north of Stalinabad (Dushambe), and in three quite different stations. First station, Kondara Valley, 3600 ft., is situated on the lowest part of the zone of the mountain forests; second station, Kvak, 6600 ft.; third station, Rujdasht, 10,000 ft., is situated on the subalpine zone. To Mr. V. B. Popov, Zoological Institute, Leningrad, I find the opportunity to express here my gratitude for his kindness in interpreting for me many types of *Anthidium* and *Osmia* of Morawitz in the above Institute.

Anthidium thomsoni F. Mor.

Kvak, 1 ♀, 21. vii.

Anthidium taschenbergi F. Mor.

Kondara Valley, 1 ♀, 1 ♂, 3. vii. Kvak, 1 ♀, 23. vii.

Anthidium cingulatum Latr.

Kondara Valley, 1 ♀, 17. vi.; 1 ♀, 11. ix.; 1 ♂, 15. ix. Kvak, 1 ♀, 17. vii.; 2 ♀, 20. vii.; 1 ♀, 4. viii.; 1 ♂, 29. vi.; 1 ♂, 4. viii. Rujdasht, 1 ♂, 22. vii.; 1 ♀, 4. ix.

One of the two *females* from Kvak (20. vii.) has the scopa bright yellow, the other *female* has the scopa light yellowish white. The *females* from Kondara Valley have the scopa white or light yellowish white, and the *female* from Rujdasht has the scopa white.

Anthidium manicatum subsp. *hissaricum*, nov.

Female.—Length 10 mm.

Clypeus black, with broad yellow mark at sides not reaching upper part, lower margin black, nearly straight, with nine small projected tubercles; lateral face-marks reaching level insertion of antennæ, occipital stripe broadly interrupted and attenuated within, yellow. Mesonotum with an L-shaped stripe on each side nearly reaching axillæ, apical margin of scutellum laterally, yellow. Abdominal tergites 1 to 3 with broad basal yellow stripes broadly interrupted in the middle, apical margins broadly black; sixth tergite yellow, apical margin and sides very narrowly black; scopa light yellowish white.

Male.—Length 17 mm.

Thorax entirely black; first and second tergites with four yellow marks; third tergite with four yellow marks, the lateral smaller; tergites 4 to 6 with transverse and broadly interrupted yellow stripes, that on fourth slightly notched on each side of middle above; seventh tergite and the lateral spines of sixth black; femora and tibiæ black; anterior tibiæ above and apex of the middle ones yellow.

Kvak, 1 ♀ (type), 1 ♂ (allotype), 20. vii.

This interesting subspecies differs from all the known races of *Anthidium manicatum* in the characteristic form of the lower margin of the clypeus of the *female*, and the different colour of the integument.

Anthidium diadema Latr.

Kondara Valley, 2 ♀, 25. vi.; 1 ♀, 1. vii.; 2 ♀, 3. vii.; 1 ♀, 17. vii. Kvak, 1 ♀, 29. vi.; 1 ♂, 17. vii. Rujdasht, 1 ♀, 4. ix.

Anthidium florentinum F.

Kondara Valley, 2 ♀, 25. viii.; 1 ♂, 10. viii.; 1 ♂, 21. ix. Kvak, 1 ♀, 27. viii.

Anthidium anguliventre F. Mor.

Kondara Valley, 1 ♀, 5. vii.; 1 ♀, 8. vii.; 1 ♀, 19. vii.; 2 ♀, 4. viii.; 1 ♂, 15. vii.; 1 ♂, 3. viii.

Proanthidium trochantericum F. Mor.

Kondara Valley, 1 ♀, 4. vii. Kvak, 1 ♂, 22. ix.

Mr. Gussakovskij sent me also 1 ♂ from West Pamir; Chorog, 1. ix. 36 (*A. Ivanov*).

Anthidium cribratum F. Mor.

Kondara Valley, 2 ♂, 13. ix.; 3 ♀, 15. ix.; 2 ♂, 17. ix.; 1 ♂, 25. viii.

Anthidium gussakovskiji, sp. n. (Fig. 1.)

Female.—Length 7·5 mm.

Black; clypeus cream and convex, somewhat densely punctured and shining, with a narrow, longitudinal, impunctate and polished, subapical area in the middle reaching supraclypeal area; apical margin of clypeus narrowly reddish brown, straight, with a small blunt tubercle on each side and a very small sublateral one, and between the tubercles with two very slight emarginations; lateral face-marks (filling space between clypeus, supraclypeal area, and eyes) reaching level insertion of antennæ, cream; mandibles cream, 5-dentate, subapical area narrowly reddish brown, teeth black-brown; supraclypeal area with a small basal mark cream; scape black, reddish brown in front; flagellum reddish brown, dark brown behind except third and fourth joints; first joint of flagellum dark brown except the reddish-brown apex, last antennal joint black-brown in the apex in front and entirely behind; occiput with entire pale lemon-yellow stripe descending on cheeks and reaching base of mandibles (in the paratype very slightly interrupted in the middle); front, supraclypeal area, sides of face above with dense and short shining white hairs; clypeus, sides of face up to insertion of antennæ with short and sparse shining white hairs; vertex and occiput with pale yellowish-brown hairs;

cheeks with very short shining white hairs; vertex and occiput densely punctured, the intervals shining. Thorax black; mesonotum densely punctured and shining, with short and thick pale grey hairs not covering surface; mesonotum with an L-shaped pale lemon-yellow stripe on each side above nearly reaching axillæ; scutellum slightly projected, densely punctured, shining, apical margin subemarginate in the middle, broadly pale lemon-yellow (except narrowly the sides); tegulæ light reddish brown, with ochreous mark and subhyaline margin in front; scutellum with some short white hairs, apical margin with some longer white hairs; area of metathorax covered with short white hairs above; thorax with very dense shining white hairs at sides; wings clear, marginal cell with a narrow subclouded streak above; second recurrent nervure almost interstitial with second transverse cubital nervure; first cubital cell slightly smaller than second; femora and tibiæ light reddish brown; anterior and middle femora with broad pale lemon-yellow stripe beneath; apex of middle

Fig. 1.

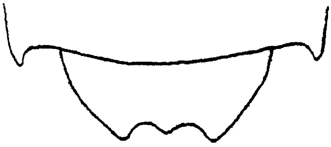
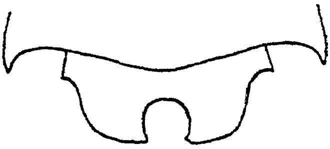


Fig. 2.



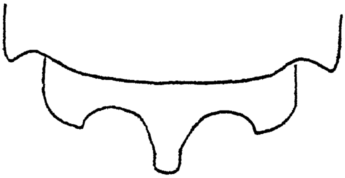


Fig. 3.

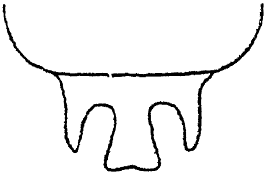


Fig. 4.

Fig. 1.—Sixth and seventh abdominal tergites of *Anthidium gussakovskiji*, sp. n., ♂.
Fig. 2.—Sixth and seventh abdominal tergites of *Anthidium kvakicum*, sp. n., ♂.
Fig. 3.—Sixth and seventh abdominal tergites of *Anthidium tadzhicum* (Popov), ♂.
Fig. 4.—Sixth and seventh abdominal tergites of *Anthidium glasunovii* F. Mor., ♂ (drawn by Mr. V. B. Popov from the type).

and hind femora narrowly pale lemon-yellow above (in the paratype anterior femora with a pale lemon-yellow apical mark above); tibiæ pale lemon-yellow, but beneath and very narrowly the sides above light reddish brown; anterior tibiæ with an obscure spot beneath; middle tibiæ with a black median mark beneath; hind tibiæ with broadly black-brown apex beneath (in the paratype the markings lacking beneath); tarsi light reddish brown; anterior and middle basitarsi densely covered with shining white hairs above, the middle ones ochreous; hind basitarsi densely covered with shining white hairs on outer side; hind spurs pale yellow; femora with somewhat dense shining white hairs above; pulvilli absent. Abdomen shining; tergites 1 to 3 with broadly the base and nearly the sides densely punctured, rest, including the apical margins, finely and densely punctured; first tergite with base light reddish brown, and with a pale lemon-yellow stripe beneath and covering sides, rest black; second and third tergites with broadly the base and sides pale lemon-yellow, rest black; the pale lemon-yellow on tergites 1 to 3 very narrowly bordered by light reddish brown beneath; fourth and fifth tergites more than the basal half pale lemon-yellow, rest black; the pale lemon-yellow on fourth and fifth tergites very narrowly bordered by light reddish brown in the middle above; the black part of fourth tergite and entirely the fifth tergite covered with short shining white hairs (the hairs of the apical margin denser); sixth tergite reddish brown, with two large sublateral pale lemon-yellow marks nearly reaching the middle; sixth tergite densely covered with very short shining white hairs, apical margin slightly incised in the middle; sternites light reddish brown; ventral scopa very dense, shining white.

Male.—Length 7·5 mm.

Similar to the *female*; supraclypeal area with transverse basal mark cream; scape with cream mark in front; flagellum reddish brown, slightly dark behind; third antennal joint shorter than 4+5, fourth shorter than fifth; femora with a stripe beneath and apex above pale lemon-yellow (the stripe on hind femora beneath not reaching base); tibiæ ochreous lemon-yellow above, light reddish brown beneath; hind tibiæ narrowly black-brown on inner side beneath; tarsi pale lemon-yellow, hind ones with narrowly the small joints light reddish brown in the apex; hind basitarsi with short light golden-white hairs on inner side; the linear basitarsi with the middle ones longer than the anterior or hind ones; apical half of tergites 1 to 3 deep reddish brown except sides; fourth and fifth tergites with broadly the apical margin deep reddish brown; sixth tergite pale lemon-yellow, with a tooth on each side, apical margin reddish brown and entire; seventh tergite with two short lateral lobes and between the lobes a broad and short blunt projection in the middle (fig 1); sixth sternite with a median narrow longitudinal branch, nearly polished, the apical margin of which rounded in the middle and toothed on each side, and with a narrow transverse polished basal branch, concave in the middle and projected into a very long subelevated spine on each side; the longitudinal median branch light reddish brown, the transverse basal one pale lemon-yellow except the light reddish-brown base, and the long basal spines light reddish brown in the apex.

Kondara Valley, 1 ♀ (type), 3. vii.; 1 ♂ (allotype), 1 ♂ (paratype), 15. vii.; 1 ♀ (paratype), 5. vii., agrees with the type; fourth tergite with base narrowly reddish brown; the narrow pale lemon-yellow stripe bordered by light reddish brown beneath; the pale on fifth tergite broadly interrupted sublaterally by light reddish brown; 1 ♂ (paratype), 2. vi., has the apical half of tergites 1 to 3 and broadly the apical margin of fourth and fifth tergites black-brown.

Anthidium gussakovskiji, sp. n., is related to *Anthidium kohli* Friese, and differs in the colour of the body and wings, in the form of the sixth and seventh tergites, and the sixth sternite of the *male*.

Anthidium kvakicum, sp. n. (Fig. 2.)

Male.—Length 10 mm.

Black; clypeus densely punctured, lower margin entire; mandibles tridentate, yellow, apex reddish brown, tip of teeth black-brown; scape black, light yellow in front, and very narrowly reddish brown in the apex; second antennal joint dark, with narrowly reddish-brown apex, rest of flagellum reddish brown, dark above (except the basal joints); clypeus, lateral face-marks (filling space between clypeus and eyes), reaching level insertion of antennæ, all light lemon-yellow; occiput with entire yellow stripe covering cheeks and nearly reaching base of mandibles; all face with shining white hairs; vertex and occiput with light yellowish-white hairs, densely punctured, intervals shining; cheeks with shining white hairs. Thorax black; mesonotum very densely punctured and dullish; scutellum projected, rounded at sides and slightly emarginate in the middle; tegulæ yellowish brown in the middle, rest light yellow, with narrowly subhyaline margin; tubercles yellow; mesonotum with an L-shaped yellow stripe at sides nearly reaching axillæ; axillæ and broadly the apical margin of scutellum yellow; wings nearly clear, marginal cell clouded above; second recurrent nervure slightly out of second transverse cubital nervure; thorax with short greyish-white hairs above, apical margin of scutellum with longer and denser hairs; thorax with dense and short shining white hairs at sides; coxæ, trochanters, femora, tibiæ light lemon-yellow; anterior and middle femora with a black mark on inner side, hind ones with a black line beneath; anterior tibiæ with a light reddish-brown stripe on inner side and with a black one beneath; middle tibiæ with a black stripe not reaching the apex beneath; hind tibiæ black-brown on inner side; tarsi light lemon-yellow, small joints with light yellowish-brown suffusion, apex of claws black-brown; pulvilli absent; spurs pale yellow; tibiæ with shining white hairs; hind basitarsi with dense shining white hairs on outer side and dense golden-white hairs on inner side. Abdomen shining; tergites 1 to 4 with base very narrowly black, rest, including sides (except very narrowly the apical margins), light yellow, apical half brown, fourth with the apical half light yellowish brown; fifth tergite yellow, apical margin light yellowish brown; sixth tergite mostly yellow, apical margin light yellowish brown and convexly produced in the middle, and with a yellow spine on each side; seventh tergite yellow, with two broad rounded lobes, and between the lobes a rounded incision, base laterally with a small tooth (fig. 2); first and second tergites with the yellow disk sparsely punctured, rest finely and somewhat densely punctured; sternites nearly light yellow and with short white hairs.

Female.—Length 7 mm.

Similar to the *male* ; mandibles long, with three basal teeth and an apical one, and between the apical and subapical with five denticles ; apical margin of clypeus entire ; scape reddish brown, yellow in front (the yellow not reaching the base or the apex), and black behind (the black not reaching the apex) ; vertex and occiput with light yellowish-brown hairs. Mesonotum and scutellum with golden-white hairs ; the hairs on the apical margin of scutellum longer and denser than the male. First tergite with the base and sides (except very narrowly the apical margin) light lemon-yellow, rest deep reddish brown ; tergites 2 to 4 with broadly the base and the sides (except very narrowly the apical margins) pale lemon-yellow, rest deep reddish brown ; fifth tergite pale lemon-yellow, with subapical narrow deep reddish-brown stripe, apical margin deep yellowish brown ; sixth tergite pale lemon-yellow, with slight subapical depression in the middle, apical margin slightly emarginate and sides entire ; ventral scopa white ; sixth sternite with a tuft of apical light yellowish-brown hairs in the middle ; apical tergites with sparse white hairs.

Kvak, 1 ♂ (type), 1 ♀ (allotype), 4. viii.

The *female* of *Anthidium kvakicum*, sp. n., differs from *Anthidium littorale* F. Mor., from Bacu, in the form of the scutellum and the colour of the body and the legs, and other details.

Anthidium obscuratum F. Mor.

Kvak, 2 ♂, 4. viii. Rujdasht, 1 ♀, 22. vii.

Scutellum and axillæ black or in one of the *males* the apical margin of scutellum (interrupted in the middle) and outer side of axillæ cream. First abdominal tergite with a cream spot on each side ; second tergite with four cream spots or with transverse median cream lateral stripe nearly reaching the middle ; tergites 3 to 5 on each side of middle with a mark and a sublateral spot cream (the spots lacking in one specimen) or with broadly interrupted cream stripe nearly reaching the sides, sixth and seventh tergites black.

Anthidium punctatum Latr., subsp.

Rujdasht, 1 ♀, 2 ♂, 22. vii.

Female.—Length more than 7 mm.

Head entirely black; a yellow spot above each eye; tegulæ yellowish brown and pale yellow in front; thorax black, with pale yellowish-brown hairs above; femora and tibiæ black; anterior and middle tibiæ yellowish brown on inner side, and with a linear yellowish-brown stripe on inner side above; anterior and middle femora with the apex yellowish brown. First tergite with lateral mark cream; second tergite with a sublateral cream linear stripe slightly interrupted in the middle; third and fourth tergites with an entire transverse cream stripe on each side of middle; rest of tergites black; scopa white.

Male.—Length more than 7 mm.

Similar to the *female*; scape with an apical light yellow mark in front; clypeus, lateral face-marks not reaching level insertion of antennæ, mandibles except teeth light yellow; anterior and middle tibiæ yellow above, outer side except the apex black; hind tibiæ with the apex narrowly yellow above; the sublateral long cream stripe on second tergite interrupted a little beyond the middle and attenuated within; tergites 3 to 5 with transverse linear cream stripe on each side of middle; sixth and seventh tergites black; apex of lateral lobes of seventh tergite dark.

This pair differs from specimens of European *Anthidium punctatum* Latr. in the colour of the integument and pilosity, and probably it represents a new race of *Anthidium punctatum.*

Another *male* from Rujdasht, 22. vii., is similar to the above specimens of *Anthidium punctatum*, and differs as follows:—

Second tergite with slightly interrupted cream stripe; tergites 3 to 5 with transverse cream stripes, that on fifth not reaching the sides; sixth tergite with median broad cream stripe; lateral lobes of seventh tergite cream.

This *male* is closely related to *Anthidium punctatum albofasciatum* Friese.

Dianthidium insulare persicolum Mavrom.

Kondara Valley, 1 ♀, 2. vi.; 1 ♀, 28. vi.; 1 ♀, 13. vii.; 1 ♂, 25. viii. Kvak, 1 ♂, 4. viii. Rujdasht, 1 ♂, 3. ix.

One of the *females* has the yellow stripe on third tergite slightly interrupted in the middle, the *males* have the yellow stripe on second tergite slightly interrupted or entire and that on third entire.

Anthidiellum strigatum luteum (Friese).

Kvak, 1 ♀, 4. vii.; 1 ♂, 13. vii.

Anthidium tadzhicum (Popov). (Fig. 3.)

Rujdasht, 2 ♀, 5 ♂, 4. ix.; 1 ♂, 3. ix.

Popov described *Anthidium tadzhicum* ♀ as a subspecies of *Anthidium fedtschenkoi* F. Mor., but *Anthidium fedtschenkoi* and *Anthidium tadzhicum* are sufficiently different in colour and structure, and I think that they belong to two distinct species.

The *female* of *Anthidium tadzhicum* has the vertex, occiput, and upper part of cheeks very densely punctured and dull (in *fedtschenkoi* vertex and occiput very strongly and somwehat sparsely punctured, shining, upper part of cheeks very sparsely punctured); mesonotum with short dull yellowish-grey hairs, nearly covering the surface laterally, very densely punctured and dullish (in *fedtschenkoi* mesonotum glabrous, very strongly and somewhat sparsely punctured and dull, nearly impunctate at sides above); first and second abdominal tergites somewhat sparsely punctured, apical margin impunctate, polished and shining (in *fedtschenkoi* first tergite very sparsely punctured, second sparsely punctured, apical margins impunctate, polished and shining).

The *male* is similar to the *female*; length 12–13 mm.; sixth and seventh tergites as in *Anthidium fedtschenkoi* (fig. 3); apical margin of sixth tergite more produced, and seventh tergite with the median spine longer than in *fedtschenkoi*, very convex up to subapical area (in *fedtschenkoi* median spine uniformly slightly convex up to the apical margin); second sternite normal, rest of sternites densely covered with somewhat long white hairs (in *fedtschenkoi* second and third sternites with transverse subapical keel, sternites 2 to 4 with very sparse hairs, somewhat dense at sides).

Anthidium tadzhicum (Popov) is closely related to *Anthidium reinigi* Alfken, from Westliche Täler, West

Pamir (Alfken, in Mitt. Zool. Mus. Berlin, xvi. pp. 840–842, 1931), and it is probable that both species are identical.

Anthidium fedtschenkoi F. Mor.

Kvak, 1 ♂, 20. vii.; 1 ♂, 17. vii.

Archianthidium forcipatum F. Mor.

Rujdasht, 1 ♂; 22. vii.

Anthidium laterale auripes Eversm.

Kondara Valley, 1 ♂, 2. vi.; 1 ♀, 1 ♂, 29. vii.

Anthidium glasunovii F. Mor. (Fig. 4.)

Female.—Length 14 mm.

Agrees with the description of the *male*; clypeus black and shining, broader than long, strongly punctured, dense at sides, apical margin produced into a blunt triangular tubercle in the middle; clypeus narrowly polished and impunctate in the middle above; supraclypeal area densely punctured, with a broad longitudinal area impunctate and polished; mandibles black, with four very short and blunt teeth; lateral face-marks reaching level insertion of antennæ and then narrowing along inner orbits to the top, a large mark at sides of occiput a little descending on cheeks red-brown; clypeus, sides of face, supraclypeal area with short brown hairs; antennæ black, joints 3 to 5 in front, scape very narrowly in the apex, deep reddish brown; third antennal joint longer than fourth or fifth; vertex and occiput with deep brown hairs. Mesonotum and scutellum with dense and short black-brown hairs above; femora black; apex of femora and rest of the legs red-brown. Abdomen with very short black hairs, somewhat longer and denser at sides; ventral scopa light reddish brown, the short hairs on sixth sternite black-brown; pulvilli present; second recurrent nervure slightly out of second transverse cubital nervure.

Tashkent District: Ak-Tas, 1 ♀ (allotype), 9. vii.

Morawitz described *Anthidium glasunovii* from the *male*, and the *female* is new. This species is closely related to *Anthidium tridentatum* Friese, and probably the latter is only a subspecies of *Anthidium glasunovii*.

Anthidium glasunovii subsp. *hissarense*, nov.

Male.—Length 15·5 mm. (abdomen curved in the apex). Black; clypeus except the apical margin, lateral face-marks (filling space between clypeus and eyes) reaching level insertion of antennæ and then narrowing along inner orbits to the top, mandibles except the apex all yellow; the broad lateral occipital red-brown mark reaching the middle and slightly attenuated within; vertex and occiput with dense reddish-brown hairs; front up to insertion of antennæ with reddish-brown hairs, rest of head below antennæ with dense and long very light reddish-brown hairs; the hairs of the apical margin of clypeus and base of face laterally tinged with yellowish white; antennæ black, apical half of scape and second joint, third and fourth joints reddish brown. Thorax with somewhat short and dense reddish-brown hairs above. First abdominal tergite with lateral yellow mark in the middle; second tergite with broad basal yellow mark at sides, broadly attenuated on inner side beneath; third tergite with broader and longer basal yellow mark at sides, emarginate in the middle beneath; fourth and fifth tergites with more than the basal half yellow and broadly interrupted in the middle; sixth tergite yellow, apical margin black and truncate, sides rounded and broadly black; seventh tergite black, the median very broad and long emarginate spine has a very large rounded yellow spot in the middle; the yellow on the disk and sides of tergites 1 to 5 with short light yellowish-brown hairs, rest with black-brown hairs, apical margin broadly and densely covered with short black-brown hairs except the sides; sixth tergite with light yellowish-brown hairs.

Female.—Length 13 mm. (end of abdomen bent).

Similar to the *male*; clypeus as in the typical *female*; scape, second antennal joint in the apex, joints 3 to 5 reddish brown; the pilosity on clypeus and supraclypeal area somewhat sparse and light reddish brown, without tinge of yellowish white. The yellow abdominal stripe on second tergite emarginate in the middle beneath, and that on third without emargination; sixth tergite densely covered with yellowish-brown hairs, yellow (broadly interrupted in the middle), apical margin narrowly black; ventral scopa dense and yellowish brown.

Kvak, 1 ♂ (type), 1 ♀ (allotype), 10. vi.

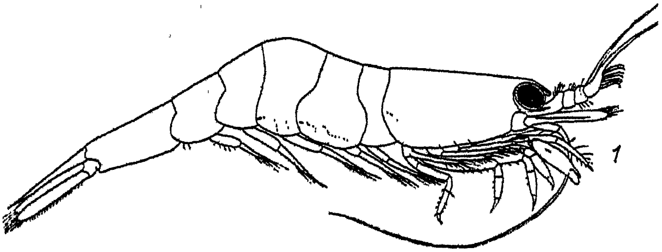
Differs from the typical *male* from Jagnob in the different colour of the pilosity and the presence of rich yellow ornaments on abdomen.

XLIV.—*A new Species of the Decapod Genus* Discias *Rathbun from Bermuda.* By Robert Gurney.

Discias atlanticus, sp. n.

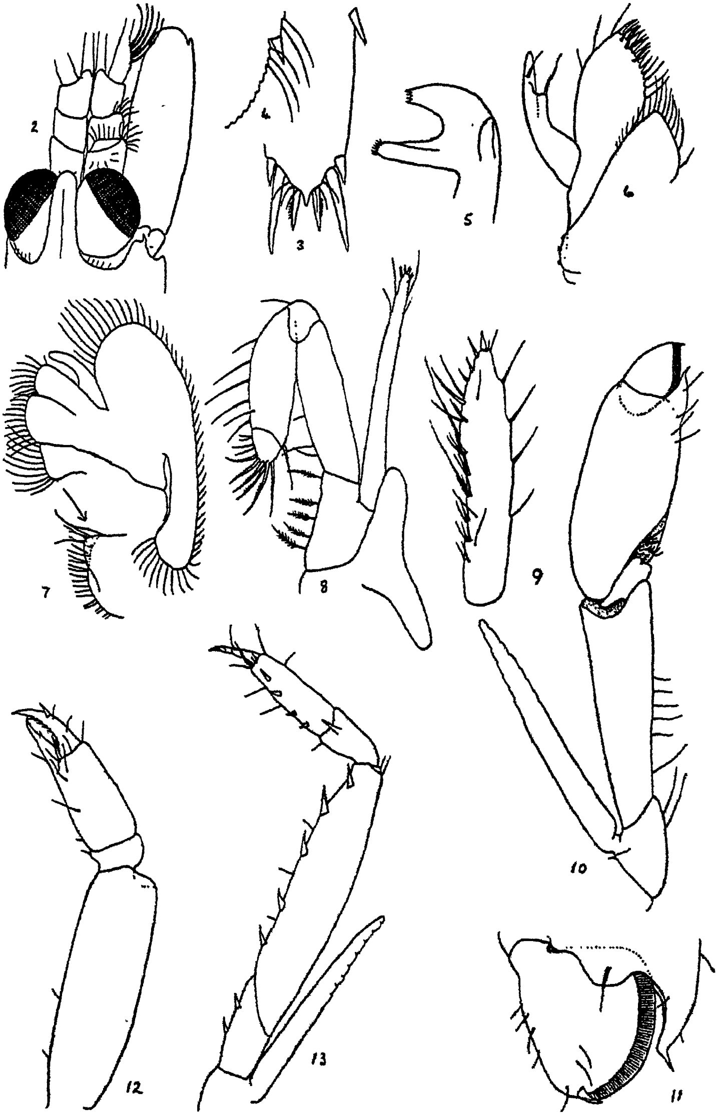
Female.—Length 11 mm.

Rostrum depressed, narrow, with slight median ridge, not extending beyond eyes. Orbit with a few small hairs round the margin, and bounded below by an antennal spine; anterior ventral angle of carapace rounded. Pleura of abdominal somites 4 and 5 rounded; somite 6 about twice as long as somite 5, with small anal spine and no posterior lateral spines. Telson nearly four times as long as wide, with two pairs of lateral spines; apex with median point and three pairs of spines, of which the second pair is the longest.



Adult male.

Eyes large and globular. Peduncle of antennule much shorter than antennal scale; stylocerite pointed and



Female.

2. Dorsal view of head. 3. Part of telson. 4. Outer angle of uropod. 5. Mandible. 6. Maxillule. 7. Maxilla. 8. Maxillipede 2. 9. Maxillipede 3, last segment. 10. Leg 1. 11. Leg 1, end of chela. 12. Leg 2. 13. Leg 3.

reaching beyond middle of basal segment; basal segment without apical spines and with very small ventral spine, statocyst absent; segments 2 and 3 short and stout; flagella more than 1½ times length of peduncle. Antennal scale three times as long as wide, with slightly convex outer margin ending in a very small spine. Flagellum reaching back, when fully reflexed, to about fourth abdominal somite.

Mandible deeply divided, the narrow molar part projecting beyond incisor part; palp small, unsegmented. As only one mandible was examined it is possible that the palp may be abnormal. Maxillule with basal endite rather broad, pointed, with minute hairs on its outer projection or exite; palp with two setæ. Maxilla with well developed basal endite not much recessed behind endite 2; endite 1 is provided with the usual fringing setæ and also a small distal flap which may represent the distal lobe of this endite, which is commonly present, if reduced, when the endite is fully developed.

Maxillipede 1 with coxal lobe more than ¾ as long as basis; endopod apparently not segmented; epipod very large and bilobed. Maxillipede 2 with very large bilobed epipod; basis and ischium fused, carpus very short; propod about 2½ times as long as wide; dactyl fully as long as wide, the joint with the propod slightly oblique. Maxillipede 3 with small epipod; merus with small terminal spine as in *D. exul*; last segment nearly twice as long as carpus and five times as long as wide, nearly parallel-sided, with transverse rows of small spines.

Leg 1 closely resembling that of *D. exul*. Ischium and merus fused, but basis distinct; carpus a minute sclerite, not visible on inner side, where the chela fits directly into the hollowed end of the merus; palm rather more than twice as long as wide, not narrowed proximally as it is in the other two species, and with a deep hollow in the posterior face in which is a transverse row of small spines; dactyl a round flat plate with a small spine at distal end of outer face.

Leg 2 with ischium and merus fused; carpus very short; palm nearly twice as long as wide and about 1½ times as long as dactyl; dactyl a curved tapering claw with a series of small marginal teeth.

Legs 3–5 decreasing in length. Legs 3 and 4 with two inner spines on ischium and five on merus; carpus with one spine; propod with five spines on leg 3 and three on leg 4. Leg 5 with two spines on ischium, three on merus, one on carpus. Terminal claw in each leg simple, but with very minute spines at end.

Epipods and arthrobranchs absent.

Pleopod 1 with endopod very small, without appendix interna. Exopod of uropod about four times as long as wide; outer margin with fringe of short setæ, and ending in a single spine.

Male differing from the female only in having appendix masculina on pleopod 2.

One male and one female taken in plankton at night in the shallow waters of the Reach close to the Bermuda Biological Station on July 24 and 25, 1938. These days were three and two days before the new moon, and on these nights there was a rich plankton, including natant stage of *Panulirus*, adult *Penæopsis* sp., *Periclimenes americanus*, and *Gnathophyllum americanum*.

This species, while agreeing closely in general with the two species previously described (*D. serrifer*, Rathbun, 1902, *D. exul* Kemp, 1920), differs in a number of details. The greater length of abdominal somite 6 and the form of the telson alone suffice to distinguish it readily from both. In having the pleura of abdominal somites 5 and 6 rounded it agrees with *D. exul* and differs from *D. serrifer* as described by Miss Rathbun, but Balss (1923) has given a figure of *D. serrifer* which shows these pleura rounded.

The mouth-parts present some points of difference and interest. The proximal lobe of the maxilla is much less reduced than in *D. exul*, and the terminal segment of maxillipede 2 is not of the narrowed form seen in *D. exul* and in most Caridea, but resembles that of Hoplophoridæ and Pasiphæidæ.

The systematic position of *Discias* is obscure. Miss Rathbun recognized that it was necessary to found a new family for it, and regarded it as allied to the Atyidæ and Hoplophoridæ. Kemp pointed out that the form of mandible and maxilla is quite unlike that of these two families, and that the presence of exopods on the legs was not sufficient to determine relationship, since these might well be reacquired in the adult by survival from the larva. He concluded that it is in the Hippolytidæ and Palæmonidæ that the nearest living allies of *Discias* are to be found.

With this conclusion I find it difficult to agree entirely. It is certainly true that the presence of exopods on the legs cannot be taken as conclusive evidence of relationship; but it must be pointed out that it is only in the Atyidæ, Pasiphæidæ, and Hoplophoridæ that an exopod is retained on leg 5 at any stage in the life-history, and it is unlikely that the adult would acquire one on this leg if it was absent in the larva. It is true that this is what actually happens in the Pasiphæid *Leptochela* (Gurney, 1936), but in this case the exopod is found in the adults of the whole group, and its suppression in the larva is the remarkable feature.

The form of the dactyl of maxillipede 2 in *D. exul* is very much more like that of the "higher" Caridea than it is in *D. atlanticus*, where it is indeed distinctly of Hoplophorid form. Apart from the presence of exopods on all legs and the form of maxillipede 2 there is nothing in the appendages to suggest a near relationship to the Hoplophoridæ or Pasiphæidæ. The superficial resemblance in general form to *Leptochela* is not supported by agreement in structure of the appendages.

The only genus which does seem to have some real affinity with *Discias* seems to be *Bresilia* Calman (1896), in which there is the same reduction of gills and almost exactly the same form of maxillipede 2. In this genus the exopods have been lost from the last three pairs of legs, and there are other differences which make it impossible to include *Discias* within the same family; but it would seem that both are aberrant genera retaining some primitive features of the Pasiphæidæ and Hoplophoridæ, and to be placed close to them in the system.

It is possible that some light may ultimately be shed upon the relationship of these genera by their larval history when it is known. The structure of legs 1 and 2 in the larva *Anisocaris dromedarius* Ortmann is almost identical with that of the adult *Discias*, and if it were not for the large size of the larva according to Ortmann's figure it might be claimed with some certainty as belonging to this genus. This larval genus has been referred by Coutiere to the Pasiphæidæ, but at present no Pasiphæid is known with a larva of this kind. The only Pasiphæid with a normal series of larvæ known is *Leptochela*, and this larva has no resemblance to *Anisocaris*.

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RATHBUN, M. J. 1902. "Papers from the Hopkins Stanford Galapagos Expedition, 1898–1899.—VIII. Brachyura and Macrura." Proc. Wash. Acad. Sci. iv. pp. 275–292.

XLV.—*A Revision of the* Acrochordinæ (*Snakes*). By MALCOLM A. SMITH, M.R.C.S. From the Department of Zoology, British Museum (Natural History).

THE Acrochordinæ have been distinguished from the Colubrinæ by having the orbit roofed over by a forward prolongation of the postorbital bone. This character has been deemed sufficient to unite two very different groups of snakes, namely *Acrochordus* and *Chersydrus*, without ventral shields, on the one hand, and *Xenodermus*, *Nothopsis* and *Stoliczkaia*, with ventral shields, on the other. A detailed examination of all these genera shows that there are many other differences between them, and the interests of taxonomy would be best served by regarding them as distinct subfamilies, the Acrochordinæ and the Xenoderminæ. Both Cope, in 1898 *, and Werner, in 1909 †, suggested separation, and Dr. Brongersma, in a paper on the anatomy of *Xenodermus*, now in the press, has reached the same conclusion.

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* Rept. U.S. Nat. Mus. 1898, 1900, p. 731.

† Mitt. Naturh. Mus. Hamburg, xxvi. 1909, p. 206.

In the Xenoderminæ must be included two other genera, namely *Fimbrios* and *Achalinus*, the five being linked together by a number of unusual characters, which are as follows :—A supraorbital bone; vertebræ with strong lateral expansions to the zygapophyses; dorsal scales completely or almost completely attached to the cutis, more or less separated from one another by areas of naked skin; labials with everted margins; nostril in a large, expanded, concave shield. Only *Xenodermus* now has all the characters; the degree to which they are developed in the other genera is shown in the following table :—

Genus.	Zygapophyses.	Dorsal scales.	Labials everted.	No. of species in genus.
Xenodermus	Produced.	Separated.	Strongly.	1
Nothopsis	Produced.	Sub-imbricate.	Feebly.	2
Stoliczkaia	Produced.	Separated.	Feebly.	2
Fimbrios	Not produced.	Separated.	Very strongly.	1
Achalinus	Not produced.	Separated.	Feebly.	5

The manner in which the orbit is roofed over is variable. In the Acrochordinæ it is made by a forward prolongation of the postorbital bone, which is in contact laterally with the frontal, but is moveable upon it. In the Xenoderminæ, except in *Xenodermus*, in which the condition is much as in *Acrochordus*, the roof is formed by a more or less completely ossified piece of bone, which is usually united with the frontal and may be connected anteriorly with the prefrontal or posteriorly with the postorbital. The character, however, and the degree of ossification is variable, a condition to be expected in a dwarfed and degenerate group.

As regard the scalation of the head, the passage from *Xenodermus*, in which the whole head except the snout,

is covered with small granular scales, to *Fimbrios* and *Achalinus*, in which the head is completely shielded, is through *Nothopsis* and *Stoliczkaia*.

The distribution of the Xenoderminæ, namely the Oriental Region and Central and South America, is paralleled by that of the Pit Vipers (*Trimeresurus*) among the snakes, and the Microhylidæ among the Amphibia.

XLVI.—*Beitrag zur Kenntnis der* Therevidæ *und* Omphralidæ. Von O. Kröber, Hamburg.

Therevidæ.

Thereva striatifrons Krb. liegt vor von Kenya : Naivasha, vii.–viii. 1937 (*H. J. A. Turner*).

Thereva nitidiventris, sp. n., ♀. (Fig. 1.)

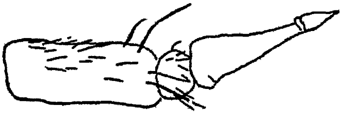
Kenya : Naivasha, vii. 1937 (*H. J. A. Turner*).

Type im British Museum (Natural History), London.

Länge 8 mm., Fühler fast 1mm., Flügellänge 6 mm., -breite fast 2 mm.

Stirn und Scheitel glänzend schwarz. Ozellenhöcker matt braun mit 3 roten Ozellen. Untergesicht und Partie oberhalb der Fühler silberglänzend mit ±gelblichem Ton. Fühler schwarz. 1. und 3. Glied fast gleich lang. 1. schwarz behaart und beborstet. Alle 3 weiss tomentiert. Untergesicht schwarz behaart. Thorax schwarzbraun, matt, mit 2 klaren weisslichen Längslinien, die fast bis zum Schildchen reichen. Dieses ist graubraun mit dunkelbrauner Mitte. Pleuren matt

Fig. 1.



Thereva nitidiventris, sp. n., ♀. Fühler.

graubraun, spärlich weiss behaart. Schüppchen bräunlich, Schwinger schwarzbraun. *f* matt schwarz, *t* gelbbraun mit schwarzen Spitzen. Tarsen gelbbraun, gegen die Spitze bis zu Schwarz verdunkelt. Hüften weiss behaart. Flügel graulich, schwarzadrig, bei einem ♀ stark gesäumt, so dass nur graue Zellkerne übrigbleiben. Stigma schwarz. 4. Hinterrandzelle und Analzelle kurz gestielt. Hinterleib glänzend schwarz; 2.–4. Tergit mit silberweissem Hinterrandsaum, 5. und 6. mit solcher Seitenmakel. Vom 4. Ring ab beiderseits kurz abstehend schwarz behaart. Borstenkranz schwarz.

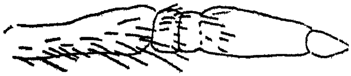
Psilocephala antennata, sp. n., ♂. (Fig. 2.)

S. Rhodesia: Bulawayo, 27. vii. 1923 (Rhodesia Museum).

Type im British Museum.

Unterscheidet sich von *P. pallidicornis* Krb. durch folgendes: Äusserstes Stirndreieck matt schwarz. Augenrand hinten mit schwarzen Seten. 3. Fühlerglied in der Basalpartie wulstartig abgeschnürt, fast ein Glied vortäuschend. Thorax glänzend schwarz mit 2 weisslichen Linien bis zum Schildchen. Behaarung lang, aber zerstreut, weisslich. Schildchen schwarz. *f* ganz gelbrot. Flügel glashell, ungefleckt. Stigma deutlich, braun.

Fig. 2.



Psilocephala antennata, sp. n., ♂. Fühler.

Der obere Gabelast ist seltsam geschwungen. 4. Hinterrandzelle geschlossen und gestielt. Hinterleib im Grunde glänzend schwarz mit dichtem Silberglanz. 2.–6. Tergit mit glänzend schwarzem Seitenfleck am Vorderrand, der selber schwarz schimmert. 4. Tergit schwarz mit kleinem, viereckigem Silberfleck. Genitalien, Analsegment glänzend rotgelb.

Länge 6·5 mm., Fühler fast 1 mm., Flügellänge 5 mm., Breite fast 2 mm.

Die obern Augenfazetten sind etwas grösser als die untern, durch eine dunkle Linie scharf getrennt.

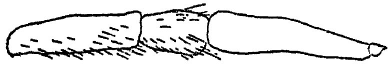
Phycus maculipennis, sp. n., ♂. (Fig. 3.)

UGANDA : Kampala, 4. xii. 1929 (*H. Hargreaves*).
Type im British Museum.

Länge 8·2 mm., Fühler 2 mm., Flügellänge 7 mm., -breite 2·1 mm.

Stirn nach oben bedeutend verschmälert, nicht breiter als der Ozellenfleck, silbern tomentiert mit einem glänzend schwarzen fünfeckigen Fleck. Ozellen gelb. Hinterkopf schwarz mit 2 weiss tomentierten Flecken unterhalb des Ozellenflecks. 1. Glied der Fühler doppelt so lang als das 2.; beide schwarz, so behaart. 3. Glied braun, so lang wie die 2 andern mit kleinem Endgriffel. Taster anliegend, kurz, schwarzbraun, Rüssel von gleicher Länge, oben schwarz, unten gelbrot, fleischig. Hinterkopf weiss behaart, Borstenkranz schwarz. Thorax schwarz, fast glanzlos, bei gewisser Beleuchtung mit 2 fast weissen Striemenanfängen. Behaarung anliegend, zart gelblich. Vor der Flügelwurzel 2 starke schwarze Borsten. Schildchen gleicht dem Thorax. Schwinger schwarz. Flügel glashell mit braunem, scharf abgesetztem Spitzenfleck. Dessen Grenze läuft über die Spitze der Discalzelle, wurzelwärts von der Gabel der 3. Längsader nach der Mitte der Unterrandzelle und nach der Spitze der 4. Hinterrandzelle. Alle Adern zart braun. Pleuren und Hüften schwarzbraun, grau bereift, Vorderhüften durchscheinend gelbbraun, ebenso f_1. Hüften am Ende mit je 3 krummen Borsten, die der p_3 am kürzesten und stärksten. p_3 schwarzbraun; t_1 und Vordertarsen desgleichen; p_2 gelbbraun, f_2 dunkelbraun. Abdomen zart, vom 4. Ring an seitlich kompress, glänzend schwarz, 1.–3. abstehend sehr zart weiss behaart, vom 4. ab schwarz. 2.–4. Tergit mit feinem, weisseidigem Hinterrandsaum, der des 2. am breitesten.

Fig. 3.



Phycus maculipennis, sp. n., ♂. Fühler.

Omphralidæ.

Omphrale papuana Krb., affin.

1 ♀ von der Malayenhalbinsel Kuala Lumpur. Gleicht ausserordentlich *papuana*, ist aber viel schmaler gebaut. Stirn und Thorax grünlich glänzend, aber sehr dicht anliegend weisslich behaart. 1. Fühlerglied braunschwarz; 2. und 3. heller rotbraun mit leicht verdunkelter Spitze des 3. *f.* mässig keulig. Flügel kaum etwas schwärzlich tingiert. In der Beschreibung von *papuana* muss es Ann. Mus. Hung. xi. 1913, p. 207, heissen: Hinterleib 2 mm. lang. Ich wage nicht, auf dies Einzelstück eine Art zu gründen.

Die neuen Arten gliedern sich wie folgt in meine Bestimmungstabelle (Stettin. Ent. Zeit. xcviii. 1937) ein:

aethiopische Arten, p. 225.

3.	Stirnstrieme und Abdomen durchaus schwarz.	4 *a*.
4*a*.	Schwinger schwärzlich	*O. stenogaster* Ség.
	Schwinger hellbraun. *p* ganz hell rotgelb ...	*O. flavipes*, sp. n.

indo-australische Arten, p. 225.

4.	Stirnstrieme breit	4 *a*.
4*a*.	Abdomen kaum von der Länge des Thorax, schwarz. Flügel schwärzlich	*O. papuana* Krb.
	Abdomen so lang wie Kopf und Thorax zusammen. Flügel glashell	*O. fijianus*, n. sp.

Omphrale flavipes, sp. n., ♀. (Fig. 4.)

Kenya: Rabai, viii. 1936 (*van Someren*). *Type* im British Museum.

Länge 3 mm. Flügellänge 2·3 mm. Flügelbreite ca. 1 mm.

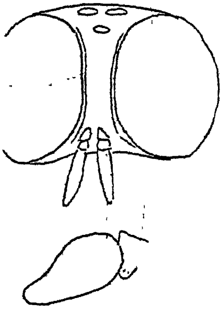
Eine sehr schlanke, zierliche Art aus der Verwandtschaft von *O. brunnea* Kröb. und *balteatus* Lamb, aber mit ganz rotgelben *p* und Hüften, hellrotem 1. und 2. Fühlerglied, gelbroten Schulterbeulen und solchem Schildchenrand.

Stirnstrieme schmal, fast parallelrandig, ca. ¼ der Kopfhöhe ausmachend, etwa 3 mal so hoch wie breit, glanzlos, zart gelbweiss behaart, mit Längsfurche in den untern ⅔, am Augenrande fein glatt, hellschimmernd. Fühler sehr kurz, birnförmig. 1. und 2. Glied rotorange, gelb behaart, 3. schwarz. Thorax matt, bronzegrünlich, chagriniert, zart gelblich behaart. Schulterbeulen glänzend rotgelb. Schwinger durchaus hellbraun. Hinterecken des Thorax und Schildchenrand breit rotgelb.

Flügel glashell, zart braunadrig. Geäder wie bei *O. brunnea* Kröb. Das Basalstück der Gabelader ist nicht ganz so lang wie der untere Gabelast. *p* nebst Hüften einheitlich hell rotgelb, glänzend, Metatarsen der p_3 weissgelb. Nur die kleinen Klauen sind schwarz. Hinterleib fast schwarz, glanzlos, ganz zart und kurz gelblich behaart, mit etwas missfarbenen, olivegrünlich wirkenden Hinterrandbinden. Bauch einheitlich schwarz olive, fast glanzlos, ohne Binden.

Ich glaube kaum, dass diese Art die Macquartsche *O. scutellata* sein kann, die Bezzi von Eritrea erwähnt. Diese feine Kopfform wäre ihm sicherlich aufgefallen, da sie sich so ganz anders darstellt als der plumpe Kopf von *O. fenestralis* L.

Fig. 4.



Omphrale flavipes, sp. n., ♀. Stirnstrieme, Fühler.

Omphrale fijianus, sp. n., ♀. (Fig. 5.)

Fiji Inseln : Suva, 8. iii.–28. iv. (*H. W. Simmonds*).

Type im British Museum.

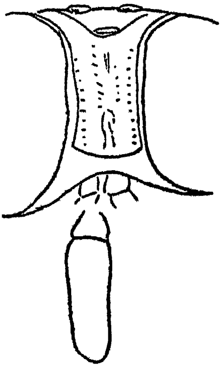
Länge 3 mm. Flügellänge ca. 2.5 mm.

Aus der Verwandtschaft von *O. longiventris* Kröb.

Stirnstrieme ca. doppelt so hoch als breit, etwa $\frac{1}{4}$ der Kopfbreite einnehmend (b.. *O. zeylanicus* Senior White ca. 1/9 !). Alle *t* gleich den Tarsen hellrotgelb (bei *zeylanicus t* dunkelbraun). Thorax und Schildchen grünlich schimmernd (bei *zeylanicus* schwarz, bei *longiventris* fettig schwarz).

Stirn verhältnismässig breit, mit feiner Mittelfurche, die unten fast in eine Grube ausläuft, quer nadelrissig, ziemlich stark grünlich glänzend. Die untere Stirnpartie ist etwas vorgewölbt. Untergesicht scharf gegen die Stirn abgesetzt, glanzlos weiss (bei *longiventris* seidig glänzend). Fühler schwarz, wie in der *fenestralis*-Gruppe. Endglied lineal, mindestens 3 mal so lang wie breit, vorn abgerundet, nicht eingekerbt. Brustseiten glänzend schwarz. Schulterbeulen rotbraun. Flügel glashell, mit feiner brauner Aderung. Basalstück der Gabelader fast doppelt so lang als der untere Gabelast. Aderung ähnlich wie bei *longiventris*. Schwinger schmutzig braun. Hinterleib wenig länger als Kopf und Brust zusammen, beiderseits schwarz, ziemlich glänzend, ohne irgend welche Bandierung. Hüften und *f* schwarzbraun, glänzend. Knie rotgelb. t_{1+2} hellrotgelb, t_3 bräunlich, wie bei *longiventris*. Tarsen fast weissgelb. Hinterhüften mit einer Reihe langer, sehr zarter, abstehender Haare. t_1 mit 2 langen Haaren an der Spitze. f_2 mit äusserst zarten, lang abstehenden hellen Haaren, die fast von der Breite der f_2 sind.

Fig. 5.



Omphrale fijianus, sp. n. Stirnstrieme, Fühler.

Von *O. civiculus* Hardy scheint sie der Beschreibung nach schon durch das 3. Fühlerglied verschieden, das an der Aussenseite einen deutlichen Eindruck trägt. Ausserdem werden die *p* hier als braun bezeichnet, das Tarsenende als "stained with black." Schwinger mit weissen Knöpfchen. Die Grösse wird mit 5–6 mm. angegeben.

Omphrale sinensis Krb. liegt vor von Kuala Lumpur, 14. xi., 24. vii.

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NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 16. APRIL 1939.

XLVII.—*The Plankton of Lake Windermere, England.*

By G. H. WAILES.

[Plates XIV. & XV.]

THE Lake Windermere is situated on the borders of the counties of Westmorland and Lancashire, it is ten miles in length, extending from latitude 54° 17′ to 54° 25′ North, with an average breadth of about half a mile; low hills rising in places to 1000 feet border it closely. The surface of the water is 39·3 metres (129 feet) above sea-level with a maximum depth of 60 metres (200 feet): the geological formation consists of igneous and Silurian rocks.

The lake is divided into the north and south Basins of equal length, separated by some islets and a shallow shelf; the volume of water is estimated at 347 million cubic metres (455 million cubic yards): at the north end a river and some small streams discharge into it, whilst at the south end the river Leven carries off the surplus water, the outflow averages 1·4 million cubic metres (1·8 million cubic yards) per diem, which represents a change of water every nine months; with heavy rains the level of the water may rise one metre, the outflow increasing to 3·5 million cubic metres per diem.

The South Basin receives drainage effluents from various towns, thus increasing the nitrogen content of the water and promoting a large growth of phyto-plankton that is abundant throughout the year and may equal or even exceed the zoo-plankton in bulk; at no time does a lack of nitrates seem to be a limiting factor to this growth of algæ, but there may at times be a deficiency of phosphorus.

In the North Basin Crustacea form the greater bulk of the plankton, especially in winter when over 90 per cent. may consist of Copepoda and Cladocera.

Material examined.—Samples of plankton have been received from the laboratories of the Freshwater Biological Association of the British Empire at Wray Castle, they were collected every two weeks since September 1937; sixty of these preserved samples have now been examined, covering a period of fifteen months: they were obtained by single vertical hauls of a fine-meshed net 30 centimetres (11¾ inches) diameter; in the north Basin the hauls were from 40 metres to the surface, in the South Basin from 30 metres, commencing at from 5 to 10 metres from the bottom, all were taken from approximately the same position in each Basin.

Personal visits were paid to Wray Castle in August 1937 and 1938, which afforded opportunities for examining organisms that were either not caught in the small plankton net or were not identifiable in the preserved samples; collections made with a one metre diameter coarse net revealed that the larger crustaceans were inadequately represented in the small net collections, also it was found by centrifuging 10 c.c. samples of water that an important *Nanno-plankton* existed, the individuals composing it being either too small or too frail to be otherwise observed in a living and undamaged state.

Conclusions.—The plankton of Windermere is unusually abundant, the amounts obtained by single vertical hauls of the 30 centimetre net varying from about ·7 c.c. in winter to 4 c.c. in summer.

The zoo-plankton is characterized by the abundance, especially in the North Basin, of the Crustacea, consisting largely of Copepoda, the Rotifera are also numerous both in species and individuals; Vorticella represented by two pelagic species occur in large numbers, the identification of these presents difficulties, the spherical colonies so abundant here and also in many North

American lakes do not appear to have been previously figured and they are identified with some hesitation, the literature of this genus is most voluminous; the synopsis by Kahl (1935) is here followed.

Heliozoa are not numerous, but one species is a new record for Great Britain, namely, *Raphidiocystis lemani*, of which there are very few records and these from large lakes such as the lake of Geneva, from which it takes its name.

No pelagic Rhizopoda were observed in the net collections.

The *Dinoflagellates*, principally *Ceratium*, may amount at times to 4 per cent. of the phytoplankton, they are absent during the winter months; owing to the polymorphism so prevalent among the freshwater species and the divergent views held as to their nomenclature and affinities, figures of the forms found are here given, as these are desirable for their comparative study and critical identification.

The *Phytoplankton* is characterized by the dominance of the stellate diatoms, *Tabellaria* and *Asterionella*, associated with *Cœlosphærium*, *Anabæna*, and *Oscillatoria* these Myxophyceæ being occasionally in sufficient numbers to colour the water; the Chlorophyceæ are most numerously represented by a *Cosmarium* and five species of *Staurastrum*, which are consistently present throughout the year; on an average, the Phytoplankton may be estimated to consist of Bacillariaceæ 60 per cent., Chlorophyceæ 20 per cent., and Myxophyceæ 20 per cent., with a total comprising 5 per cent. of the whole plankton in winter up to 50 per cent. at times in the South Basin, even in winter, the larger nitrogen content of the water there being no doubt contributory to this exuberant growth.

The Plankton of Windermere, so far as information is available, is similar in general characteristics to that of large lakes in about the same latitude, such as Lake Erie (Snow, 1903), Lake Superior (Taylor, 1935), Shuswap Lake (Clemens, 1937), and Lake Michigan (Eddy, 1927) in North America.

Acknowledgments.—I wish to express my thanks to the British Freshwater Biological Society for the opportunity of examinin the Windermere plankton and to their

Director, Dr. E. B. Worthington and his staff at Wray Castle laboratory, for the facilities placed at my disposal; to the Council of the British Association for the use of their table at Wray Castle; to Mr. E. H. Ahlstrom of the University of California, for examining material and identifying the Rotifera; to Mr. J. D. Scourfield for supplying a list of the Crustacea and for other records and specimens.

CRUSTACEA.

The only crustaceans found in the plankton were species of Cladocera and Copepoda, but in August in various places near shore the Amphipod *Gammarus pulex* was numerous and close inshore near Wray Castle the Cladocera were represented by *Polyphemus pediculus* in large numbers.

CLADOCERA.

Daphnia hyalina var. *galeata* Sars.

The dominant species of Cladocera, numerous throughout most of the year.

Bosmina obtusirostris Sars.

Nearly as numerous as the above throughout the year.

Ceriodaphnia pulchella Sars.

Chiefly in the South Basin, where it is often numerous.

Diaphanosoma brachyurum var. *productifrons* Sars.

Fairly common from about June to September.

Holopedium gibberum Zaddach.

Scarce; present only in the summer and autumn.

Leptodora kindti Focke.

Not uncommon from May to October.

Bythotrephes longimanus Leydig.

Occurs during the summer, May to September.

COPEPODA.

Cyclops leuckarti Claus.

Very numerous during the summer months.

Cyclops strenuus var. *abyssorum* Sars.

The dominant species of *Cyclops*, occurring throughout the year.

Diaptomus gracilis Sars. (Pl. XIV. fig. 6.)

Common throughout the year; colour yellowish or pale blue, sometimes coloured red by included oil-drops.

Diaptomus laticeps Sars. (Pl. XIV. fig. 7.)

Occurs only in the colder part of the year, about October to May. Colour various shades of blue, often coloured red by included oil-drops.

Nauplii were more or less numerous throughout the year.

ROTIFERA.

No previous list of rotifers in Windermere has been published, but in August 1933 the late David Bryce made manuscript lists of the species found in the district

List of species.	North Basin.		South Basin.	
	Summer.	Winter.	Summer.	Winter.
Aplanchna priodonta Gosse	Pres	C	Pres	VC
Chromogaster ovalis (Bergendal)	RC	RC	RC	..
Collotheca mutabilis (Hudson)	Pres	..	..	..
Conochilus unicornis Rousselet	..	C	..	VC
—— *hippocrepis* (Schrank)	Pres	..	R	..
Diurella porcellus (Gosse)	R	..	R	RC
—— *rousseleti* (Voigt)	..	..	R	..
—— *stylata* Eyferth	RR	R	RR	..
—— *weberi* Jennings	R	..	RR	..
Euchlanis meneta Myers	Pres	..	..	..
Filina longiseta (Ehrenberg)	Pres	C	RC	C
Gastropus stylifer Imhof	RC	..	RC	..
Kellicottia (*Notholca*) *longispina* (Kellicott)	VC	VC	C	C
Keratella cochlearis (Gosse)	VC	VC	C	C
—— *quadrata* (Müller)	Pres	C	RC	C
Lepadella patella (Müller)	..	RC	..	..
Polyartha trigla Ehrenberg	RC	RC	RC	..
Synchæta grandis Zacharias	R	RC	..	..
Trichocerca capucina (Wierzejski)	RC	..	RC	..
Pedalia mira Hudson	..	RR	..	..
Recorded in Bryce MS., 1933.				
Cephalodella exigua (Gosse)	Pres	No collections made.		
Lecane mira (Murray)	Pres			
Microcodides chlæna (Gosse)	Pres			
Synchæta tremula (Müller)	Pres			
Total .... 24 species.	20	12	14	7

Summer includes the months May to August; Winter the months September to April. The sign C signifies common; VC, very common; RC, rather common; R, rare; RR, very rare; Pres, presence noted.

including those in plankton from the North Basin: among the twelve plankton species he found are four that have not been observed in the present collection of preserved samples. The accompanying list (p. 405) has been compiled by A. H. Ahlstrom from mixed samples of plankton taken in summer and in winter from the North and South Basins respectively.

Males of *Trichocerca capucina* were observed, but a detailed description of them is omitted from this report.

The *Rotifera* in Windermere are numerous both in species and individuals, forming an important constituent of the plankton throughout the year.

PROTOZOA.

HELIOZOA.

Acanthocystis chætophora (Schrank).

Syn. *Acanthocystis turfacea* Archer.

Commenced to appear in the plankton in June, became common by the end of that month, and disappeared by the end of July; is disrupted in preservative, but can be identified by its forked spines, which are best observed dry.

Var. *simplex* Wailes. (Pl. XV. fig. 18.)

Nearly all those observed were of this variety, which is distinguished from the type by the absence of the short Y-shaped spines.

Diameter about 50 to 60 μ, but observed 100 μ diameter among the littoral flora.

Acanthocystis spinifera Greeff. (Pl. XIV. fig. 8.)

Very few seen, diameter about 50 μ.

Raphidiophrys elegans Hertwig & Lesser. (Pl. XV. figs. 16, 17.)

Occurred in August and September both singly and in small groups, is disrupted by preservative. Diameter of body 25 to 30 μ (–40 μ).

Elæorhanis oculea (Archer).

Syn. *Elæorhanis cincta* Greeff.

Recorded from Windermere by Brown; in the nannoplankton young individuals 11 μ diameter which had not yet any outer investment were found by Scourfield.

Raphidiocystis lemani Penard. (Pl. XV. fig. 19.)

It is a rare species confined to the larger lakes; single individuals observed in June and October by Scourfield. Not hitherto recorded from Britain.

Body 22 μ diameter; outer investment 40 μ diameter, trumpet spines 45 to 70 μ in length; spicules 4 μ diameter.

RHIZOPODA.

Only littoral species were represented by the occasional individuals found in the plankton; among those most frequently seen were *Arcella vulgaris* and *A. discoides* with their allied species, if these by wave action or other cause are washed off the plants to which they usually adhere and sink to the bottom, they can (as observed by Penard) secrete bubbles of gas, enabling them to float and regain their position, they are thus liable to be carried into open water. It is possible this may occur also with other species.

The following were also noted:—*Difflugia* spp., *Nebela* (*Quadrula*) *symmetrica*, *N. collaris*, *N. galeata*, *Euglypha* spp., *Cyphoderia ampulla* and var. *vitræa*, *Microcorycia flava*, *Pseudochlamys patella*, *Cryptodifflugia oviformis*.

In the nanno-plankton small *Amœbæ* are found which require cultural methods for their identification.

FLAGELLATA.

Monosiga ovata Saville-Kent. (Pl. XIV. fig. 12.)

Epiphytic on *Asterionella* in June. Rare.

Diplomita socialis Saville-Kent. (Pl. XIV. fig. 13.)

Epiphytic on *Tabellaria* in June. Rare.

Cryptomonas erosa Ehrenb. (Pl. XIV. fig. 9.)

Numerous in North Basin during August and September; hardly identifiable in preserved material.

Length 13–20 μ (–25 μ); breadth 8–10 μ (–15 μ).

CILIATA.

Balanophrya (*Holophrya*) *mamillata* Kahl. (Pl. XIV. fig. 10.)

Not infrequent in centrifuged samples during August; those seen were 25–33 μ diameter and apparently juveniles, no adults which measure 85–130 μ diameter were seen.

Tintinnopsis (*Tintinnidium*) *wrayi* Wailes. (Pl. XIV. fig. 11.)

Seen active only in centrifuged samples during August. Rare.

Length 40 μ; diameter 20 μ.

Vorticella sphærica d'Udeken. (Pl. XIV. fig. 14.)

Usually attached to *Tabellaria*, around which it may form globular colonies numbering 6 to 20 individuals, but not infrequently many more: occurs numerously except in winter.

Diameter 22–30 μ; stype 15–20 μ in length.

Vorticella similis Stokes. (Pl. XIV. fig. 15.)

Forms globular colonies usually around *Anabæna* cells, numbering up to 200 individuals, but as a rule less than 20 in number; it is numerous except in winter, it is rarely attached to Copepoda.

Length 40–50 μ; diameter 28–32 μ; stype from one half to twice the length of body.

Strombidium viride Stein f. *pelagica* Kahl.

A few small individuals belonging to this species were seen, diameter 26 μ (usually 40–60 μ), in centrifuged material.

DINOFLAGELLATA.

Gymnodinium paradoxum Schilling. (Pl. XV. fig. 25.)

Occurs numerously in the northern part of the North Basin during August; colour golden-brown; length 28 to 36 μ, breadth 20 to 30 μ; nucleus 8 to 9 μ diameter.

Schilling's figure is so vague the attribution to his species is somewhat doubtful. Stein (1883) figures more than one species as *G. pulvisculus*, his Figure 14, Tafel 3, may represent this species.

Glenodinium inconspicuum, comb. nov. (Pl. XV. figs. 20, 21.)

Numerous in summer at the northern end of the North Basin; the empty theca greatly resembles *Peridinium inconspicuum*, but no plates were elucidated—it is probably the *Glenodinium* stage of that species. It occurs numerously in ponds near the lake.

Length 14 to 17 μ; breadth 12 to 15 μ; cyst 14 μ diameter.

Peridinium inconspicuum Lemmermann. (Pl. XV. fig. 22.)

A few seen in August and September in the North Basin.

Length 22 to 25 μ; breadth 18 to 20 μ.

Peridinium willei Huitfeldt-Kaas. (Pl. XV. fig. 27.)

Present mostly from April to June, becoming numerous in May; characterized by spined fringes at the apices, the girdle is displaced one girdle breadth.

Length 50 to 60 μ; breadth usually in excess of the length.

Peridinium kincaidi Wailes. (Pl. XV. fig. 26.)

Present from February to October, numerous all summer; no spined fringes are present, the girdle is displaced two girdle-breadths.

Length 45 to 55 μ, the breadth equal to or less than the length.

Not previously recorded from Britain, it occurs in British Columbia and Alaska.

This species has 12 plates only in the epicone (instead of the normal 14) and it may be regarded as derived from *P. cinctum* by the elision of the third apical and first intercalary plates.

P. cinctum var. *lemmermanni* G. S. West is a form of this species.

Peridinium tabulatum (Ehrenb.) C. & L. (Pl. XV. fig. 23.)

Syn. *Peridinium bipes* tab. *travectum* f. *tabulatum* (Ehrenb.) Lefevre.

Only a few seen; length about 60 μ; breadth 55 μ.

Regarded by Lefevre as a form of *P. bipes*.

Peridinium volzi Lemm., forma. (Pl. XV. fig. 24.)

Syn. *Peridinium tabulatum* of several authors.

Only a few seen; length about 38 μ; breadth 35 μ.

Not previously recorded from Britain; when sufficient material is available it will no doubt be found advisable to give this form a specific name, at the present time unless records of *P. tabulatum* are accompanied by descriptions or drawings it is impossible to know if this or Ehrenberg's species was the one under observation. In Lake Erie, N. America, the writer found this species numerous in the plankton, but in that case the left side of the sulcus projected prominently—this, however, is not infrequent in non-European forms of *P. volzi*.

Ceratium hirundinella O. F. M. f. *gracile* Bachmann. (Pl. XIV. figs. 2–5.)

This variety is abundant from March to November; cysts, which occur numerously in the autumn, are three-angled and differentiate it from the type which has four-angled cysts.

Length 90 to 200 μ; breadth about 60 μ; cysts 60 to 95 μ in length.

It was not a dominant, but may at times form 4 per cent. of the phytoplankton.

Ceratium hirundinella f. *robusta* Amberg. (Pl. XIV. fig. 1.)

In this form the third antapical spine is present, but is not so long or so divergent as in the type; it is normally 25 μ in length, but is often shorter, and intermediate forms between this and forma *gracile* are common.

Not numerous, most frequent in the South Basin in the spring.

Length 150 to 260 μ; breadth about 60 μ.

PHYTOPLANKTON.

CHRYSOPHYCEÆ.

Synura uvella Ehrenb.

Rare.

Mallomonas mirabilis.

Common and usually present throughout the year.

Dinobryon divergens Imhof.

Common during May and June, when spore-formation becomes frequent: never a dominant, and absent in winter.

Dinobryon cylindricum Imhof.

Scarce.

HETEROKONTÆ.

Botryoccus braunii Kutz.

Not common.

CHLOROPHYCEÆ.

Sphærocystis schroeteri Chodat.

Common.

Dictysphærium pulchellum Wood.
Very common.

Eudorina elegans Ehrenb.
Usually present in moderate numbers.

Volvox mononæ G. M. Smith.
Occasionally common.

Pediastrum boryanum (Turp.).
Few.

Westella botryoides (W. West).
Common.

DESMIDIACEÆ.

Cosmarium contractum var. *ellipsoideum* Elfv.
Staurastrum brevispinum Bréb.
Staurastrum curvatum West.
Staurastrum paradoxum Mayer.
Staurastrum pseudopelagicum W. & G. S. W.
Staurastrum lunatum var. *planctonicum* West.
Arthrodesmus incus (Bréb.) Hass.
Spondylosium planum (Wolle) W. & G. S. W.
Xanthidium subhastiferum var. *murrayi* W. & G. S. W.

All the above are present throughout the year and very numerous except in winter.

Xanthidium antilopeum (Bréb.) Kutz.
Not numerous; intermediate forms between this species and *X. subhastiferum* are not uncommon.

Cosmocladium constrictum Archer.
Not uncommon in June.

Cosmocladium pulchellum Bréb.
Colonies of up to twelve individuals frequent in June.

Cosmarium abbreviatum var. *planctonicum* W. & G. S. W.
Usually present in small numbers.

Amongst the occasional occurrences of single individuals the following were noted: *Closterium moniliferum*, *C. lunula*, *C. venus*, *C. kutzingii*, *Euastrum verrucosum* var. *reductum*, *Cosmarium turpini*, *C. subcrenatum*, *Staurastrum margaritaceum*, and *Desmidium swartzi*.

MYXOPHYCEÆ.

Cœlosphærium nägelianum Unger.

Usually the dominant species of blue-green alga present throughout the year.

Oscillatoria tenuis Ag.

Always present and usually numerous except in winter, 4–6 μ diameter.

Anabæna flos-aquæ (Lyngb.).

Often abundant.

Anabæna lemmermanni Richter.

Few.

Anabæna circinalis (Kutz.).

Scarce.

Microcystis æruginosa Kutz.

Frequent.

Microcystis flos-aquæ (Wittr.).

Frequent.

Aphanocapsa elachista var. *planctonica* G. M. Smith.

Common.

The epiphyte *Stylosphæridium stipitatum* was commonly attached in considerable numbers to the colonies of *Cœlosphærium*.

Cœlosphærium kutzingianum Näg.

Was occasionally present in small numbers.

DIATOMALES.

Tabellaria fenestrata (Lyngb.).

Few.

Tabellaria fenestrata var. *asterionelloides* Grunow.

Present throughout the year and usually the dominant species of Diatom.

Tabellaria floculosa (Roth).

Few.

Asterionella formosa Hass.

Not so numerous as the following species, but usually present.

Asterionella gracillima (Hant.).

Much fewer than *Tabellaria*, except in winter when it may equal or exceed that species in numbers; present throughout the year.

Melosira granulata (Ehrenb.).

Present throughout the year, sometimes numerous.

Fragillaria crotonensis (Edw.).

Usually present and moderately numerous.

Rhizosolenia eriensis H. L. Smith.

Scarce.

Breadth 8–15 μ; striæ about 10 in 20 μ.

Rhizosolenia eriensis var. *morsa* West.

Not infrequent during summer.

Breadth 4 to 6 μ with 10 striæ in 10 μ (easily overlooked except in dry mounts).

Cyclotella comta (Ehrenb.).

Usually present in small numbers.

A few other species were represented only by occasional individuals such as *Surirella biseriata*, *Campylodiscus hibernicus*, and *Navicula* spp.

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EXPLANATION OF THE PLATES.

PLATE XIV.

Fig. 1. *Ceratium hirundinella* f. *robusta.* Side and ventral views in outline. ×250.
Figs. 2, 3, 4. *Ceratium hirundinella* f. *gracilis.* Dorsal, ventral, and side views of three individuals in outline. ×225.
Fig. 5. Cyst of f. *gracilis.* Broad and narrow views. ×250.
Fig. 6. *Diaptomus gracilis.* Furca of female. ×250. (Male is similar.)
Fig. 7. *Diaptomus laticeps.* Furca of male and female. ×250.
Fig. 8. *Acanthocystis spinifera.* ×250.
Fig. 9. *Cryptomonas erosa.* ×1100.
Fig. 10. *Balanophrya* (*Holophrya*) *mammillata.* ×900; with a section of the surface enlarged.
Fig. 11. *Tintinnopsis* (*Tintinnidium*) *wrayi.* ×600.
Fig. 12. *Monosiga ovata.* ×1000.
Fig. 13. *Diplomita socialis.* ×1000.
Fig. 14. *Vorticella sphærica.* ×325.
Fig. 15. *Vorticella similis.* ×250.

PLATE XV.

Fig. 16. *Raphidiophrys elegans.* ×600.
Fig. 17. *Raphidiophrys elegans.* A colony of six individuals. ×350.
Fig. 18. *Acanthocystis chætophora* var. *simplex.* ×250.
Fig. 19. *Raphidiocystis lemani.* ×400; with "trumpet" spine and small spicule enlarged.
Fig. 20. *Glenodinium inconspicuum.* ×500. 20 *a.* Girdle view of antapex. ×800.
Fig. 21. *Glenodinium inconspicuum.* Spore formation. ×700.
Fig. 22. *Peridinium inconspicuum.* ×500.
Fig. 23. *Peridinium tabulatum* (Ehrenb.) C. & L. ×425.
Fig. 24. *Peridinium volzi,* forma. ×420.
Fig. 25. *Gymnodinium paradoxum.* ×450.
Fig. 26. *Peridinium kincaidi.* Dorsal, ventral, antapical, and apical views. ×350.
Fig. 27. *Peridinium willei.* Dorsal, ventral, apical, and side views. ×400.

XLVIII.—*The Occurrence of* Crenobia (Planaria) alpina *in the Birmingham District.* By M. D. UNWIN, B.Sc., and R. J. WHITNEY, B.Sc. (From the Zoology Department, University of Birmingham.)

THE distribution of *Crenobia* (*Planaria*) *alpina* (Dana) has for a long time held the interest of ecologists of inland waters. This turbellarian flatworm, because of its intolerance of high temperatures, is only found in streams and springs where the temperature does not exceed

15° C. (Thienemann, 1913). According to Dr. R. S. A. Beauchamp, however, it will live for several weeks at 20° C. if gradually introduced to this temperature (private communication). This observation has been confirmed by us. Moreover, the method by which the animals reproduce is dependent upon the temperature of the water in which they are living. When this temperature does not exceed 11° C., normal sexual reproduction with cocoon formation takes place (Steinmann, 1907). Above 11° C. reproduction is entirely by transverse fission, a process which was observed as long ago as 1814 by Dalyell. The main interest of *Crenobia alpina* to freshwater ecologists, however, has been the discontinuous character of its distribution. On the Continent it occurs only in the springs and streams of mountainous districts where the water is sufficiently cold, the animals being quite absent from the intervening territories. This discontinuous distribution has been accounted for by the theory that *Crenobia alpina* is a relict animal of the last Ice Age (Zschokke, 1908). During this Age the animals probably lived in the cold water coming from the melting ice just beyond the edges of the ice sheets. With the close of the last Ice Age, however, the animal would be obliged to follow the retreat of the ice sheet or else remain at such places as still continued to provide a cold temperature—such as the springs and streams of mountainous districts. After the retreat the animals would present the distribution observed at present, namely, a spasmodic appearance in quite isolated places. Dispersal from these places in post-Glacial times has been discounted as an explanation of the present distribution on account of the necessity for cold water on the part of the animal itself, and the impossibility of its coccons being carried from place to place by such agents of dispersal as birds (Voigt, 1904).

In the British Isles *Crenobia alpina* is quite plentiful in such places as springs and streams in the mountainous regions of Scotland, Wales and the Lake District (Whitehead, 1922; Carpenter, 1928; Ullyott, 1936). It was thought to be absent from the flatter Midland districts of England, where springs and streams having a maximum summer temperature of only 15° C. would be rare. The present note is concerned with some observations of ours in the Birmingham district.

While collecting in a small brook which flows between Woodcock Lane and Shenley Lane, Northfield (Warwickshire), one of us noticed the presence of a turbellarian, which we subsequently identified as *Crenobia alpina*. Our identification was kindly corroborated by Dr. Baylis, of the British Museum, and by Dr. Beauchamp, of the Zoology Department, Cambridge. The animals were present in the stream from November, 1937, to December, 1938, and during this period the temperature of the brook did not exceed 13° C. Most of the time the temperature was 8° C. or less. On examining other brooks in the locality we found *Crenobia alpina* in a spring-fed brook which, after flowing about ten yards, joins an overflow stream of the Bartley Green Reservoir. A few animals were found in the stream itself. Both of these habitats are located in a field between Moors Lane and Genners Lane, Northfield.

Hitherto we have known of no localities in the Birmingham District where *Crenobia alpina* has been found. Dr. Beauchamp informed us that this species was quite common in springs in the Cotswold district, and that he had also found it in a spring near Church Stretton. It seems quite possible, therefore, that the distribution of *Crenobia alpina* is not so restricted as has been supposed. It may occur in many other streams and springs in the Midlands, and any spring-fed stream can be suspected of harbouring the animals. We shall be very interested to hear of any new locality of this species in the low-lying Midland district.

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XLIX.—*The Piaget Collection of Mallophaga.*—Part VI.
By Gordon B. Thompson.

[Continued from Ann. & Mag. Nat. Hist. 1938, ser. 11, vol. ii. p. 611.]

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
Ornithobius bucephalus Giebel	7♀♀, 2♂♂.	4	*Cygnus musicus.* *Cygnus ferus.* *Cygnus olor.*
O. cygni Linn.	1♀, 1♂.	1	*Cygnus atratus.*
Acidoproctus[*] *bifasciatus* Piaget.	7♀♀, 1 imm.	8	*Dromas ardeola.* *Dendrocygna viduatus.* *Anas ratjah.*
A. marginatus Piaget	1♀.	1	*Lestris spinicauda.*
A. maximus Piaget	1♂, 4♀♀, 3 imm.	9	*Dendrocygna arborea.* *Dendrocygna vagans*
Oncophorus affinis Piaget	2♀♀, 2♂♂.	2	*Rougetius bernieri* (Madagascar).
O. bisetosus Piaget	9♀♀, 3♂♂.	6	*Rallina tricolor.* *Rallina plumbeirostris.* *Rallina isabellina.* *Porzana noveboracensis* [†].
O. cephalotes Piaget	3♀♀, 1♂.	3	*Buceros obscurus.* *Buceros bicornis.* *Rhyticeros undulatus.*
O. cephalotes var. *major* Piaget	3♀♀, 2♂♂.	2	*Buceros nepalensis.*
O. fallax Piaget	4♀♀, 3♂♂.	3	*Porphyrio melanotus* (Celebes). *Porphyrio melanotus.*
O. flavescens Piaget	5♀♀, 5♂♂.	4	*Himantornis hæmatopus.*
O. heteroceros Nitzsch in Giebel	1♀, 1♂.	1	*Strix bubo.*
O. latifrons Piaget	1♀.	1	*Buceros semifasciatus.*
O. major Piaget	3♀♀, 3♂♂.	3	*Ocydromus laprenayus.* *Ocydromus australis.*
O. minutus Nitzsch in Giebel	5♀♀, 2♂♂.	4	*Gallinula hæmatopus.* *Gallinula orientalis* (Java). *Fulica atra.*
O. subfallax Piaget	3♂♂, 2♀♀.	3	*Porphyrio melanotus* (Celebes). *Porphyrio hyacinthia.*
O. sulcatus Piaget	3♀♀, 1♂.	2	*Parra sinensis.*
O. turbinatus Piaget	1♂ [‡].	1	*Mycteria senegalensis.*

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[*] All the specimens representing this genus were remounted by the late Dr. J. Waterston, and the original labels were not preserved. The information given above refers to the specimens as they are now and not as Piaget left them.

[†] The single female from this host, although not indicated on the label, is given as var. *porzanæ* in the 'Monograph.'

[‡] A female is mentioned in the original description, but there is no female in the collection.

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
O. unguiculata Piaget	1 ♀, 1 ♂.	1	*Eurylaimus cuculatus.*
Nirmus acuminatus Piaget	1 ♀.	1	*Ardea egretta* (Java).
N. acutangulatus Piaget	3 ♀♀, 2 ♂♂.	2	*Gracula religiosa.*
N. acutofasciatus Piaget	6 ♀♀.	3	*Plotus devaillanti.*
			Plotus melanogaster (Java).
			Numenius arquata.
N. albescens Piaget	1 ♂.	1	*Sarcoramphus gryphus.*
N. alchatæ Rudow..............	4 ♀♀, 1 ♂.	2	*Syrraphtes paradoxus.*
N. ampullatus Piaget	1 ♀, 1 ♂.	1	*Cyanopolius cooki.*
N. angulatus Piaget	1 ? ♀ *.	1	*Strix flammea.*
N. annulatus Nitzsch in Giebel ..	1 ♂.	1	*Œdicnemus magnirostris.*
N. appendiculatus Piaget	5 ♀♀, 1 ♂.	2	*Milvus ater.*
			Milvus ægyptiacus.
N. appendiculatus var.†	2 ♀♀, 2 ♂♂.	2	*Gypogeranus serpentarius.*
N. arcellus Piaget	2 ♀♀, 3 ♂♂.	3	*Agelastus meleagrides.*
			Ortyx leucotis.
N. arcus Piaget	1 ♂ ‡.	1	*Eurystomus afer.*
N. argulus Nitzsch in Burmeister.	1 ♀.	1	" Canard d'Amerique."
N. asymmetricus Nitzsch in Giebel.	5 ♀♀, 5 ♂♂.	5	*Dromæus novæhollandiæ.*
N. bicolor Piaget	4 ♀♀, 4 ♂♂.	4	*Vanellus cristatus.*
			Calidris arenaria.
			Phalaropus hyperboreus.
N. bicurvatus Piaget	2 ♀♀, 1 ♂.	2	*Vidua paradisea.*
N. bicuspis Giebel	4 ♀♀ §.	2	*Charadrius minor.*
			Recurvirostra avocetta.
N. bimaculatus Piaget	4 ♀♀, 3 ♂♂.	3	*Barita tibicen.*
N. biocellatus Piaget	1 ♂.	1	*Pica leucoptera.*
N. bisetaceus Piaget	1 ♀.	1	*Eurycerus prevostii.*
N. brachythorax Giebel	7 ♀♀, 5 ♂♂.	5	*Ampelis carolinensis.*
			Amplis garrula.
N. brachythorax var. *cedrorum* Piaget.	2 ♀♀, 1 ♂.	2	*Pyrrhula vulgaris.*
			Ampelis cedrorum.
N. brachythorax var. *modularis* Piaget.	2 ♀♀, 2 ♂♂.	2	*Accentor modularis.*
N. brevipes Piaget	2 ♀♀.	1	*Tringa subarquata.*
N. candidus Nitzsch	1 ♀.	1	*Picus centratus.*
N. castaneus Piaget.............	1 ♂.	1	*Sula piscatrix.*
N. cingulatus Nitzsch in Denny ..	8 ♀♀, 6 ♂♂.	7	*Limosa melanura.*
			Sterna nigra.
			Calidris arenaria.
			Vanellus cristatus.
			Tringa minuta.
N. citrinus Nitzsch in Giebel.....	1 ♀ ‖.	1	*Alca torda.*

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* It appears from the original description that Piaget had other specimens.

† This var. is given a name on the label, but it is not mentioned in the 'Monograph.'

‡ A female is mentioned in the original description, but there is no female in the collection.

§ A male is mentioned in the original description, but there is no male in the collection.

‖ The measurements of a male are given with the original description, but there is no male in the collection.

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
N. coniceps Piaget	1 ♀, 2 ♂♂.	3	*Ardea* sp. ? (Java). *Buceros cassidix.* *Scissirostrum pagei.*
N. cuculi Denny	2 ♀♀, 1 ♂.	1	*Cuculus canorus.*
N. decipiens Nitzsch in Denny	5 ♀♀, 7 ♂♂.	7	*Recurvirostra avocetta.* *Cyanopolius cooki.*
N. delicatus Nitzsch in Giebel	3 ♀♀, 1 ♂, 1 imm.	4	*Emberiza hortulana.* *Fringilla cannabina.* *Lamprotornis* sp. ? *Porphyrio smaragdinus* (Java).
N. densilimbus Nitzsch in Giebel	3 ♀♀.*.	2	*Fringilla carduelis.* *Pyrrhula vulgaris.*
N. dilatofasciatus Piaget	3 ♀♀ †.	1	*Eudynamis pictus* (Ternate).
N. discocephalus Nitzsch in Burmeister.	1 ♀, 1 ♂.	1	*Haliaëtus albicilla.*
N. dispar Piaget	9 ♀♀.	4	*Graculus pygmæus.* *Graculus africanus.* *Carbo sulcirostris.*
N. docophoroides Piaget	1 ♂.	1	*Tschitrea affinis.*
N. erythropteri Piaget	1 ♂.	1	*Merops erythropterus.*
N. eugrammicus Nitzsch in Burmeister.	1 ♀, 1 ♂.	2	*Larus* sp. ? (Sumatra). *Larus minutus.*
N. fuscomarginatus Denny	2 ♀♀, 1 ♂, 3 imm.	3	*Sterna gracilis.* *Podiceps cristatus.* *Podiceps auritus.*
N. frater Piaget	1 ♀, 1 ♂.	2	*Macroglossus aterrimus.* *Lamprotornis amethystina* (Habesh).
N. furvus Nitzsch in Burmeister	7 ♀♀, 1 ♂.	4	*Vanellus cristatus.* *Totanus fuscus.*
N. fuscus Nitzsch in Denny	15 ♀♀, 10 ♂♂.	11	*Circus cinerascens.* *Circus* sp. ? *Parus cæruleus.* *Ardea gularis.* *Falco subbuteo.* *Falco cenchris.* *Buteo vulgaris.*
N. fuscus var.‡	4 ♀♀, 3 ♂♂.	3	*Vanellus cayennensis.*
N. giganticola Kellogg	2 ♀♀.	1	*Diomedea albatros* (California).
N. glandarii Denny	2 ♀♀, 1 ♂.	1	*Garrulus glandarius.*
N. goniocotes Piaget	3 ♀♀, 3 ♂♂.	3	*Dacelo gigantea.*
N. goniodes Piaget	4 ♀♀, 3 ♂♂.	3	*Coua seriana* (Madagascar).
N. grandiceps Piaget	1 ♀, 1 ♂.	1	*Penelopides manillæ.*
N. hæmatopi Denny	1 ♀.	1	*Hæmatopus ostralegus.*

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* The measurements of a male are given with the original description, but there is no male in the colllection.

† See previous footnote.

‡ I take this to be a mistake for *N. furvus* var. (*vide* 'Les Pédiculines,' Suppl. 1885, p. 25).

Species.	No. of specimens. in B.M.	No. of slides.	Hosts.
N. holophæus Nitzsch in Burmeister.	6 ♀♀, 3 ♂♂, 1 imm.	6	*Tringa cinerea* *. *Totanus glottis.* *Totanus ochropus.* *Machetes pugnax.* *Numenius arquata.*
N. immaculatus Piaget	1 ♂.	1	*Œdicnemus crepitans.*
N. inæqualis Piaget	10 ♀♀, 3 ♂♂, 2 imm.	9	*Numenius arquatus.* *Numerius phæopus.*
N. intermedius Nitzsch in Giebel	1 ♀, 1 ♂.	1	*Turdus torquatus.*
N. interruptus Piaget	2 ♂♂ †.	2	*Phalacrocorax carbo.* *Totanus glottis.*
N. laticeps Piaget	1 ♀, 1 ♂.	1	*Aulacorhynchus cœruleogularis* (Toucan).
N. latifasciatus Piaget	2 ♀♀.	2	" Xulla mangola " ‡. *Larus crassicornis.*
N. lineolatus Nitzsch in Giebel	4 ♀♀, 2 ♂♂.	3	*Larus argentatus.* *Larus canus.*
N. longipes Piaget	1 ♂ §.	1	*Scissirostrum pagei.*
N. melanophrys Nitzsch in Giebel.	6 ♀♀, 1 ♂.	4	*Upupa epops.*
N. nebulosus Burmeister ‖	1 ♀, 4 imm.	2	*Sturnus vulgaris.*
N. nigromarginatus Piaget	2 ♀♀.	1	*Euplocamus horsfieldi.*
N. nigrosignatus Piaget	1 ♀ ¶.	1	*Gracula (Beo) javanensis.*
N. ochropygus Nitzsch in Giebel	2 ♀♀, 5 ♂♂.	3	*Hæmatopus ostralegus.*
N. olivaceus Nitzsch in Burmeister.	2 ♀♀, 5 ♂♂.	4	*Nucifraga caryocatactes.*
N. pallidus Piaget	3 ♀♀, 2 ♂♂.	2	*Ptyloryhnchus buccides.*
N. paraboliceps Piaget	1 ♀, 1 ♂.	1	*Psittacus aterrimus.*
N. parvulus Piaget	2 ♂♂.	1	*Gallinula chloropus* (Sumatra).
N. phænotus Nitzsch in Giebel	4 ♀♀, 7 ♂♂.	6	*Sterna minuta.* *Sterna nigra.* *Sterna anglica.*
N. phænotus var. Piaget	1 ♀, 1 ♂.	1	*Phalaropus platyrhynchus.*
N. phæopi Denny	1 ♀, 1 ♂.	1	*Numenius phæopus.*
N. pileus Nitzsch in Giebel	5 ♀♀, 7 ♂♂, 4 imm.	8	*Recurvirostra avocetta.*
N. platyclypeatus Piaget.	1 ♀, 1 ♂.	1	*Motacilla alba.*
N. pseudonirmus Nitzsch in Giebel.	2 ♀♀, 1 ♂, 2 imm.	5	*Numenius arquata.* *Totanus ochropus.*
N. punctatus Nitzsch in Burmeister.	2 ♀♀, 2 ♂♂.	2	*Larus dominicanus.*
N. quadrisetacea Piaget	3 ♀♀, 1 ♂.	2	*Rhynchea variegata* (Sumatra).
N. quadrulatus Nitzsch in Giebel.	4 ♀♀, 4 ♂♂.	4	*Tetrao urogallus.*

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* There is also a specimen from this host bearing a label with " n. sp." on it.

† A female is mentioned in the original description, but there is no female in the collection.

‡ I have already pointed out that this is a locality, not the name of a bird.

§ A female is mentioned in the original description, but there is no female in the collection.

‖ Piaget gives Denny as the author of this species.

¶ The measurements of a male are given with the original description, but there is no male in the collection.

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
N. rufus Nitzsch in Burmeister	21 ♀♀, 14 ♂♂.	15	*Circus cinerascens.* *Circus rufus.* *Circus cyaneus.* *Falco* sp. ? (Celebes). *Falco tinnunculus.* *Accipiter nisus.* *Spizaetos cirratus.* *Strix brachyotus.*
N. rufus var. *socialis* Giebel	1 ♀, 1 ♂.	1	*Circus cyaneus.*
N. scalaris Piaget	8 ♀♀, 5 ♂♂.	5	*Machetes pugnax.*
N. sellatus Rudow	1 ♀, 1 ♂.	1	*Larus glaucus.*
N. selliger Nitzsch in Giebel	2 ♀♀, 1 ♂.	2	*Sterna cantiaca.* *Cuculus canorus.*
N. semiannulata Piaget	3 ♀♀.	1	*Barita leuconota.*
N. semicingulatus Piaget	2 ♂♂ *.		*Strepsilas collaris.*
N. seta Piaget	1 ♀.	1	*Muscicapa* sp. ? (Celebes).
N. sexmaculatus Piaget	2 ♀♀, 2 ♂♂.	2	*Dicrurus retifer.*
N. signatus Piaget	3 ♀♀, 5 ♂♂.	4	*Recurvirostra avocetta.*
N. subcingulatus Nitzsch in Giebel	3 ♀♀, 3 ♂♂.	3	*Strepsilas interpres* (Bangka).
N. subcuspidatus Nitzsch in Burmeister.	1 ♀, 1 ♂.	1	*Eurystomus temminckii.*
N. submarginellus Nitzsch in Giebel.	1 ♀, 1 ♂.	1	*Mænura superba.*
N. temporalis Piaget	1 ♂.	1	*Buceros manillensis.*
N. triangulatus Nitzsch in Giebel	7 ♀♀, 5 ♂♂.	6	*Larus canus.* *Lestris spinicauda.* *Anser segetum.*
N. trimaculatus Piaget	1 ♂ †.	1	*Ciconia leucocephalus.*
N. trinoton Piaget	1 ♂.	1	*Macrocerus macao.*
N. truncatus Nitzsch in Giebel	3 ♀♀, 1 ♂.	3	*Scolopax gallinago.* “ Canard domestique.” *Phalaropus hyperboreus.*
N. uncinosus Nitzsch in Burmeister.	7 ♀♀, 1 ♂.	3	*Corvus cornix.* *Corvus corone.*
N. varius Nitzsch in Burmeister	3 ♀♀, 2 ♂.	2	*Corvus validissimus.* *Corvus scapulatus.*
N. vittatus Giebel	9 ♀♀, 6 ♂♂.	6	*Spizaetus occipitalis.* *Tragopan temmincki.* *Buteo jackal.*
N. zonarius Nitzsch in Giebel	3 ♀♀.	3	*Tringa minuta.* *Tringa maritima.*
N. zonatus Piaget	1 ♀, 3 ♂♂.	3	*Buceros lineatus.* *Buceros nepalensis.* *Anthracoceros convexus.*

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* A female is mentioned in the original description, but there is no female in the collection.

† The measurements of a female are given with the original description, but there is no female in the collection.

[To be continued.]

L.—*On some little-known or new Adelognathous* Curculionidæ. By Fritz van Emden (Imperial Institute of Entomology).

As supplements to the parts of the 'Coleopterorum Catalogus,' dealing with the Brachyderinæ, I published two previous papers, the first of which (1932, Stett. Ent. Zeit. xciii. pp. 115–122) contained a key to the genera and notes on some species of the Pachyrrhynchini, and the second of which (1936, *l. c.* xcvii. pp. 66–99, 211–239) was composed of some general remarks on the subfamily and keys to the tribes and genera.

In the present paper a new species is described, which is the type of the genus *Thoracocyphus*, described in the second of the above papers. In preparing the manuscript for the catalogue, species were met in several genera which, from zoogeographical reasons, were evidently quite out of place. Through the kindness of several colleagues I have been able to study these species and to compile some notes, which are published in this paper. Four of the doubtful species are in the Riksmuseum of Stockholm, and have been studied through the courtesy of Dr. A. Roman, to whom I wish to give my sincere thanks. Thanks are further due to M. L. Burgeon of Tervueren, Dr. K. Günther of Dresden, Prof. P. Lesne of Paris, Dr. A. Solari, Prof. O. de Beaux, and Dr. F. Capra of Genova. Sir Guy A. K. Marshall was kind enough to draw my attention to some mistakes, etc., in the catalogue, which I thus was enabled to alter in the manuscript or at the end of the catalogue.

Thoracocyphus denticollis, sp. n.

♂♀.—Derm black to brown with dense dark brown scaling, the following parts with white scaling: the dorsum of head and rostrum, a complete longitudinal vitta on each half of the pronotum, connected with a white stripe along the basal fifth of the third and fourth intervals, which extend towards or into a spot on the second interval on basal fifth, an oblique fascia from just behind this stripe on the fourth or fifth interval to almost the middle of the second, a similar but more disintegrated fascia behind middle, a lateral patch from behind the shoulders and seventh stria to about middle and sixth stria (reaching but the eighth stria at first quarter), and a subapical lateral patch slightly passing the seventh stria shortly behind middle, then following the seventh stria and crossing before its apex to almost the first stria, almost reaching suture at apex. Ventral surface with mainly white recumbent scales and sparser brown semierect scales or bristly scales. Legs piceous to black, with not very dense, mainly whitish recumbent scales and brown semierect to bristly scales or bristles.

Head slightly constricted behind the semiglobular, very prominent eyes, the forehead very flat. *Rostrum* parallel-sided, slightly longer than wide, the anterior end with a triangular depression, which extends into a deep longitudinal groove reaching vertex, dorsal area flat, the sides slightly callous, narrowed towards the forehead by the subdorsal impression. *Antennæ* with the scape reaching the hind margin of the eyes, the second funicular joint one-and-a-half times as long as the first and longer than the next two combined, the following joints subglobular. *Prothorax* distinctly wider than long, somewhat constricted behind apex, rather strongly dilated to almost second third, where the sides protrude as a strong blunt tooth, behind which the prothorax is suddenly narrowed to about basal width, being subparallel in basal fifth ; the base strongly bisinuate ; dorsum with a deep and rather broad median sulcus, which is more deeply impressed near apex and base, the disc very coarsely rugose-punctate. *Scutellum* small but distinct. *Elytra* ovoid, with the margin between the basal angle and the shoulders straight, the latter protruding as a strong tooth, the sides evenly rounded, the apex rather narrowly rounded ; the striæ with rather coarse punctures, which are much narrower than the intervals, the latter slightly and somewhat irregularly convex, the semierect scales in several irregular rows. *Legs* with the femora unarmed, all the tibiæ with a row of strong incurved denticles on interior surface and a distinct though somewhat hidden mucro on the inner apical end (rather obliterate on the hind tibiæ of the female)

Length : ♂ 17, ♀ 23 mm. ; width : ♂ 6·3, ♀ 9·5 mm. (in middle of elytra).

BRAZIL: Prov. Goyaz, Jatahy, Dec. 1879–Jan. 1898, Pujol leg., Fry Collection, ♂ type, ♀ paratype in the British Museum.

The generic characters of *Thoracocyphus* have been described in my key to the genera of Brachyderinæ (1936, Stett. Ent. Zeit. xcvii. pp. 78–81). The scrobes are strongly arcuate and are bent well below the eye.

Caulostrophus æquatorialis Kirsch has the claws free, and belongs to the Naupactini, where it fits well into *Macrostylus*, subg. *Amphideritus*. I have been able to examine the type, which is in the Dresden Museum, through the courtesy of Dr. Günther.

Strophosomus tomentosus Boh. 1833 (=*peruvianus* Dej., nom. nud., Boh. 1840), from Peru, has free claws and runs down to *Pantomorus*, s. str., with enclosed corbels. In the type the thorax has been stuck on and is somewhat turned about its longitudinal axis. This causes some difficulty in judging the condition of the shoulders. The elytra, are, however, strongly dilated from base to middle and the sides meet with the base in a rather obtuse angle. The shoulders are thus neither "well developed" nor "rather broadly rounded" and can only be classified under "missing." A row of long, erect bristles, which reaches the base, runs along the middle of each interval. The eyes are very prominent, with the strongest convexity somewhat behind the middle (which has induced Boheman and Schönherr to describe the species as a *Strophosomus* in spite of the connate claws of the latter), temples narrow and sloping to the neck, though the latter is not constricted.

Strophosomus cinereus Boh. The type, like that of *tomentosus*, is in the Stockholm Museum, and has been examined through the kindness of Dr. A. Roman. What has been said above about *tomentosus* stands for *cinereus* as well. The prothorax has its normal position and the elytra are somewhat more rounded towards the base. This form may be the male of *tomentosus*.

Sciaphilus setifer Boh., from Brazil, has the claws free and belongs to the Barynotini. It runs down to paragraph 26 of my synopsis (1936, p. 88). There may be some doubt in paragraph 26 with regard to the mesoepimera, as they are rather narrowly triangular. The character is rather difficult to judge in the type, which is in Stockholm, as the mesosternum has been separated from the metasternum by the pin and pushed out of its firm connection with the base of the elytra. In following paragraph 29, however, difficulties would arise at several points, and the species would at most work out as an *Epicærus*, with which genus it can hardly be related. Following 26 the present species would work out near *Naupactopsis*, from which genus it differs by the lack of a nasal plate, the antennæ not reaching the hind margin of the eyes, the corbels not bare though only narrowly enclosed, the dense hairs on the inner side of the hind tibiæ (♂), and the much smaller size. It is the type of a new genus, which may be called *Cnemotricha*, gen. n.

Strophosomus stappersi Hust. has enclosed corbels, as could be verified from a specimen identified by M. A. Hustache and compared with the type by M. L. Burgeon, of Tervueren. In my key the species leads to paragraph 45. Though the eyes are not very convex, the other characters exclude paragraph 44 and fit into 45. The eyes do not project as rounded cones, but the other characters are as in *Pomphus*, in which genus *stappersi* may well be placed.

Eugnathus squamifer Boh. was erroneously described by Boheman from Cuba. I have seen the type, which is in Stockholm. It is labelled " Celebes " and is a true *Eugnathus*, which has subsequently been described as *innotatus* Voss.

Edmundia sericea Gestro. There is a unique type only in the Genova Museum. Dr. Ferdinando Solari has been kind enough to compare it for me on the suggestion of Prof. de Beaux and Dr. Capra. According to Dr. Solari the specimen bears a label "*Edmundia*, n. sp." in Faust's writing, though it is not similar at all to *Edmundia claviceps* Reitt. *E. sericea* has a very superficial scrobe, which neither above nor beneath is sharply defined, and which is everywhere covered by hair-shaped scales. There is another, more distinct though superficial lateral scrobe, which is directed towards the upper margin of the eye and limited by the rather sharp edge of the rostrum. If the rostrum is seen from in front, this scrobe proves to be the real antennal scrobe, so that the scape must have a dorsal position, when at rest. *Edmundia sericea* Gestro belongs, therefore, to an Otiorrhynchine genus, though Dr. Solari does not feel able to suggest any particular one.

Barypithes microphthalmus Hust., of which I could compare a cotype through the courtesy of Prof. Lesne of the Paris Museum, has the claws free and belongs to the Otiorrhynchinæ. The scrobes are quite dorsal, broadly foveiform, with large pterygia, flattening and widening towards the eyes, not bent downward at all. Of the European genera *B. microphthalmus* seems to approach *Troglorhynchus*, though it does not belong to this genus.

LI.—*A new Species of the Decapod Genus* Leptochela *from Bermuda.* By ROBERT GURNEY.

THE larval and early post-larval stages of *Leptochela* found at Bermuda in 1935 were referred with much doubt to *L. carinata* Ortmann (Gurney, 1936), as it was not known if the adult specific characters are acquired at that early stage or not. Having now adults and also later adolescent stages, I am able to show that the species so common at Bermuda is not *L. carinata*, but a new species.

Adults of a *Leptochela*, which is no doubt of the same species, from Bermuda, have been seen by Mr. Burkenroad and are now in the hands of Dr. F. A. Chace; but Dr. Chace has asked me to undertake the description of the species.

My specimens were taken by the 'Atlantis' on June 14, 1938, and I am very grateful to Dr. Iselin and to the captain and staff of the ship for allowing me to go to sea in her, and for the efforts they made to obtain plankton for me. About seven miles off the south shore a net fishing, in very deep water, from 1000 metres upwards brought up 45 adult *Leptochela*, 20 of which were females and 12 of them bearing eggs. A number of specimens from 6 to 12 mm. long were later obtained on various occasions in plankton from 30 to 100 metres. No specimens, of any stage, have been taken either by day or by night in inshore waters, and it seems that this is actually a pelagic species of deep water, unlike all others of the genus, which are found in shallow water.

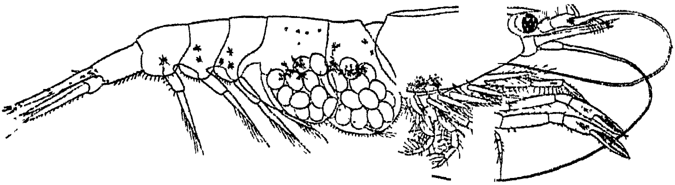
The eggs were all in very early stages of development and, although brought to the laboratory alive, the adults all died within about 24 hours.

Leptochela bermudensis, sp. n.

Length up to 16 mm.

Rostrum reaching beyond eye to end of segment 1 of antennule. Orbital margin smooth; antennal spine absent, or represented by a very small point below orbit. The carapace shows the same sexual dimorphism that has been noted by Kemp (1925, p. 250), but in some males the three dorsal keels characteristic of egg-bearing females can just be traced in the anterior third of the carapace.

Fig. 1.



Egg-bearing female.

Abdominal somites 4 and 5 rounded, and not keeled, above; margins of pleura of somites 4 and 5 generally rounded, but often with a small point. Egg-bearing females have the pleura of somites 1 and 2 enormously enlarged to form a brood-chamber. Somite 6 about twice as long as deep and very slightly shorter than somite 5. Somite 6 has an anterior dorsal transverse ridge. Telson about three-and-a-half times as long as wide, with dorsal pair of spines near base and one pair of lateral spines a little beyond the middle. There are six pairs of apical spines, since the median pair of very small spines, which seems to be lost in other species when adult, is retained.

Antennal scale about five times as long as wide.

Maxillipede 2 propod about one-and-a-half times as long as wide.

Maxillipede 3 carpus 1·2–1·25 times as long as last segment.

Leg 2 with palm 1·8 to 2·35 times as long as wide; dactyl nearly twice as long as palm. There are about 36 spines on the dactyl and 45 on the fixed finger, arranged irregularly with three to six short spines between each pair of larger ones.

Pleopod 1 of male, endopod two-and-a-half times as long as wide, with a group of small retinacula at end and of short setæ at base, but otherwise without setæ, and blunt-ended.

In females which are not carrying eggs the endopod is about half-length of exopod, fringed with setæ on outer margin and with two groups, proximal and distal, of small retinacula. In egg-bearing females the endopod is very much modified, slender, nearly as long as exopod, and bears long setæ. There is a group of four long ovigerous setæ at the end of the basis. All the eggs are borne by this pleopod alone, pleopod 2, in which the basis is fringed with setæ, closing the brood-chamber behind. This arrangement leaves the three hinder pairs of pleopods free for swimming.

Pleopod 2 of male with appendix masculina not much longer than appendix interna, and with about ten strong spines. Uropod with 10–13 spines on outer margin of exopod; endopod with four outer apical spines.

Size of eggs ·63 × ·4 mm.

Colour delicate rose-pink.

Two species of *Leptochela*, *L. serratorbita* Bate and *L. carinata* Ortmann are known from the Atlantic. This Bermudan form differs from both in having only one pair of lateral spines on the telson. The absence of spines from the orbit distinguishes it from *L. serratorbita*, and the smooth somite 5 from *L. carinata*.

There are also small differences in the mouth parts if they are compared with the figures given by De Man for *L. robusta*; for example, the proximal lacinia of the maxilla is smaller and maxillipede 2 less robust; but comparison cannot be made with other species.

Post-larval Growth.

I have examined a number of specimens of two species *L. aculeocaudata* Paulson and *L. bermudensis*, from post-larval Stage I onwards, and find they follow so exactly the same course that it is unnecessary to deal with them separately. They agree in having the pleura of somites 1 and 2 serrated, and those of somites 3–5 with points, or also serrated, in early stages. Somite 5 has a strong lateral spine. The juvenile form of the pleura may persist nearly to maturity, but tends to disappear at the third moult. The lateral spine of somite 5 may sometimes be lost even at the first moult, and generally disappears before the ventral point, but there is much variation.

The form of the telson changes little. At Stage II it is wider in front than behind and remains about the same till Stage V, when the difference in width becomes more marked; the position of the lateral spine remains about the same throughout. The dorsal pair of spines appears at the first moult in *L. aculeocaudata*, and at the second in *L. bermudensis*. The small median pair of spines may persist to the adult (*L. bermudensis*) or be lost when maturity is reached (*L. aculeocaudata*).

The most marked change during adolescence is in the sixth abdominal somite, which becomes progressively less slender and shorter in proportion to somite 5.

Measurements of the legs of *L. pugnax* (Gurney, 1936, p. 790) seemed to show a greater growth of carpus and merus than of other segments. I am inclined to doubt the value of these measurements, since it is quite possible that the material included *L. robusta* as well as *L. pugnax*. Similar measurements of *L. bermudensis* and *L. aculeocaudata* show that the changes in proportion of the segments are small and not very definite. If the absolute measurements are taken of Stage I and adult (individuals and not averages) it appears that the palm grows least and the dactyl most, while carpus and merus grow nearly at the same rate; but the differences are not large, and it may be said that these legs in Stage I have very nearly the same proportions as in the adult.

The slow growth of the exopod on legs 3–5, and of the whole leg in legs 4 and 5, is rather remarkable. The exopods on legs 4 and 5 are not fully developed until the animal is nearly mature. The arthrobranchs on legs 1 and 2 develop before those of legs 3–5, and that of leg 4 may not appear until Stage V.

The first trace of the appendix masculina on pleopod 2 appears in Stage III, at a body-length of about 7 mm. At Stage IV it is a minute, but quite distinct, bud, and it is fully formed, though without the full number of spines, at a length of 11 mm. in *L. bermudensis*. The complete suppression of pleopod 1 until Stage II is unique among Caridea, so far as is known.

The number of moults between post-larval 1 and the adult must be uncertain. The first three stages are quite well marked, but beyond that point there is less certainty, and my material is not adequate to solve the question. It would seem that there are not more than five moults in all in *L. bermudensis*, and the material for the other species, so far as it goes, bears out such a conclusion. Further evidence is found in the close correspondence between the sizes observed and the sizes as calculated, if a growth factor of 1·26 is maintained from Stage I. In *L. bermudensis* the stages may be briefly described as follows :—

Stage I. Length about 5 mm.

Maxillipede 2 with exopod.

Legs 3–5 without exopods, and legs 4 and 5 with distal part, beyond ischium, unsegmented.

Pleopod 1 absent.

Stage II. Length about 6 mm.

Maxillipede 2 without exopod.

Legs 3 and 4 with rudiment of exopod. Leg 4 with distal part unsegmented or of three segments ; this part in leg 5 unsegmented.

Pleopod 1 a rudiment of variable size, but without setæ. Telson without dorsal spines.

Stage III. Length 7–8 mm.

Exopod of leg 3 larger, but without setæ.

Legs 4 and 5 little changed, but distal part with three and two segments respectively. Arthrobranchs on legs 1–3.

Pleopod 1 with setæ. Pleopod 2 of male with minute rudiment of appendix masculina.

Telson with dorsal spines.

Stage IV. Length 7·5–8·6 mm.

Legs 4 and 5 fully segmented, the distal part flexed ; exopod of leg 4 still minute, that of leg 5 just traceable. Leg 4 still without arthrobranch.

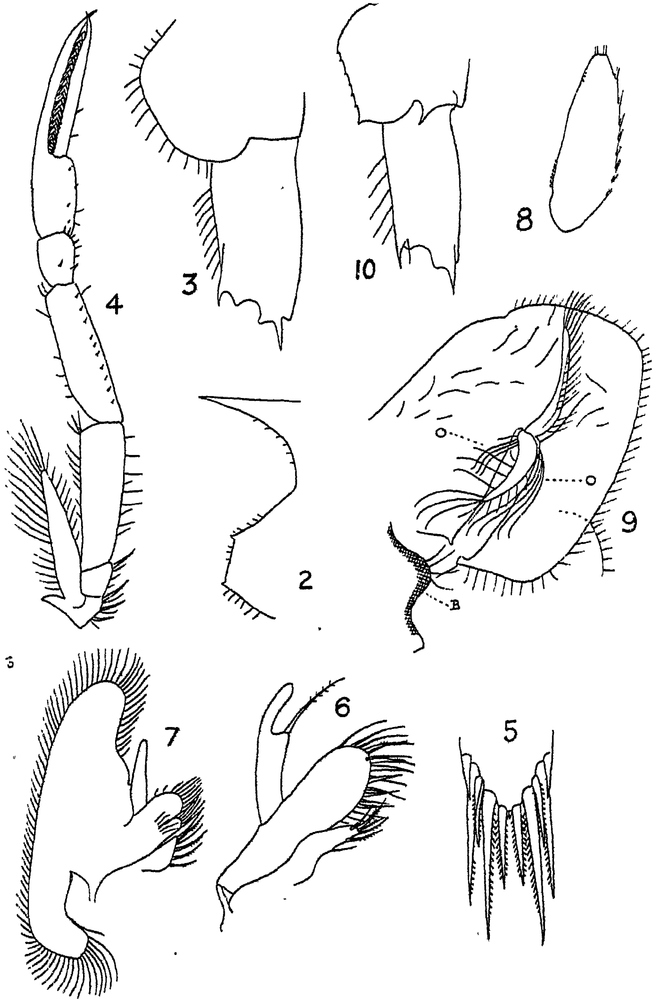


Fig. 2.—Anterior part of carapace, male.
Fig. 3.—Somites 5 and 6, male.
Fig. 4.—Leg 2, female.
Fig. 5.—End of telson.
Fig. 6.—Maxillule.
Fig. 7.—Maxilla.
Fig. 8.—Endopod of pleopod 1, female without eggs.
Fig. 9.—Pleopod 1 and pleuron of somite 1, egg-bearing female. O, ovigerous setæ. B, body-wall cut across.
Fig. 10.—Somites 5 and 6, Stage IV. 7·5 mm. long.

Pleopod 2 of male with small papilla representing appendix masculina.

Among the specimens which I regard as belonging to this stage there are differences in degree of development of legs 3–5 and of pleopod 2 of the male, but they are not such as to permit of separation into two stages.

Stage V.

Two specimens seen, a male of 11·3 mm. and a female of 12 mm. At this stage the adult characters have been fully acquired, with the exception that the appendages are less setose, and it is improbable that there is more than one moult before complete maturity is reached.

There is not much precise information available as to the number of post-larval moults before maturity is reached in other Decapoda, since it is generally impossible to distinguish definite stages after Stage II by simple inspection, and observation of moults in the laboratory may not give a true picture of natural growth. In the case of *Palæmonetes varians* (Gurney, 1924, p. 325) the sex is not distinguishable till after more than seven moults. In *Penæus trisulcatus* (Heldt, 1938, p. 161) the sexes are first distinguishable at " Stage XIII," and a length of about 12 mm., Stage IX being, according to Mme. Heldt, the first definitely post-larval stage. Stage XIII is reached about 40 days after hatching. The secondary sexual characters are, however, not fully developed till a size of 70 mm. or thereabouts is reached.

It would seem that *Leptochela* reaches full development and sexual maturity at a remarkably early stage.

Leptochela bermudensis.

Stage	I.	II.	III.	IV.	IV. ?	V.	Adult ♂.	Adult ♀.
Length	4·95	6·0	7·0	7·5	8·56	11·3	16	16
Leg 1. Dact. .	100	100	100	100	100	100	100	100
Prop. .	90	87	86	78	80	73	64	70
Carp. .	38	44	53	44	46	48	45	42
Mer. ..	110	130	140	122	130	118	115	123
Leg. 2. Dact. .	100	100	100	100	100	100	100	100
Prop. .	67	61	67	58	63	57	55	61
Carp. .	40	33	40	35	36	39	37	36
Mer. ..	89	98	107	92	100	104	100	104

Leptochela aculeocaudata.

Stage		I.	II.	III.	IV.	V. ?
Length		4·19	4·75	6·8	7·85	9·25
Leg 1.	Dact.	100	100	100	100	100
	Prop.	86	73	77	75	81
	Carp.	51	45	55	46	55
	Mer.	123	118	130	122	130
Leg 2.	Dact.	100	100	100	100	100
	Prop.	74	60	63	64	70
	Carp.	48	38	43	41	46
	Mer.	108	87	102	105	112

Measurements of the segments of legs 1 and 2 expressed as percentages of the length of the dactyl.

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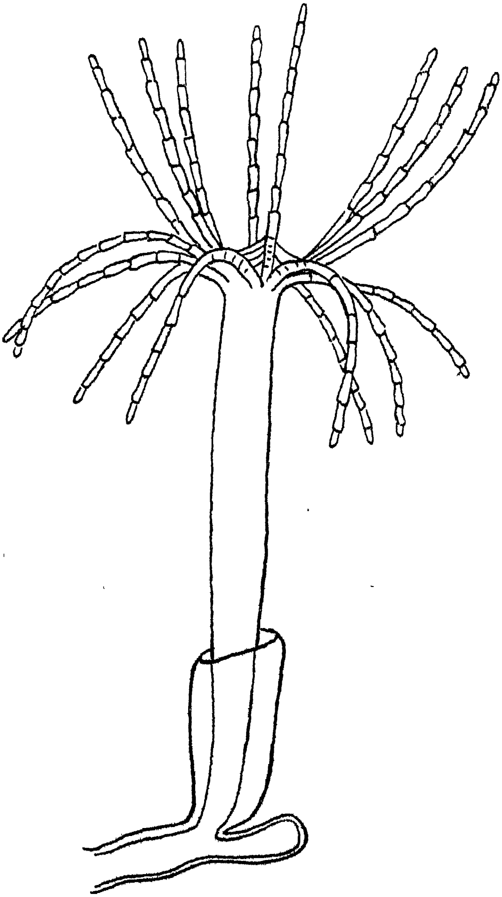
LII.—*A Revision of the Genus* Campanulina *van Beneden*, 1847. By W. J. REES, Marine Biological Laboratory, Plymouth.

INTRODUCTION.

The hydroid genus *Campanulina* has been considerably modified and enlarged by various authors since it was erected by van Beneden in 1847, so that to-day it contains a large number of hydroids many of which produce medusæ belonging to different genera and even different families. This is largely due to the use in the past of a double system of classification, which is still used to classify hydromedusæ.

There is yet much work to be done on the life-histories of hydroids and medusæ before it will be possible to establish a satisfactory classification. Medusologists, on the whole, have almost completely failed to take the hydroids (when known) into their schemes of classification, and likewise those who have worked on hydroids have evolved their own system of classification, based almost solely on the characters of the hydroids, completely



An enlarged tracing of the original figure of *Campanulina tenuis*. (After van Beneden, 1847, pl. i. fig. 6.)

ignoring the taxonomic value of their medusæ. There have been, however, a few workers who have attempted to take both stages into consideration.

Authors have differed in their opinions as to the taxonomic importance they attach to the medusa. Uchida (1927) states that " the medusa, being only the sexual organ of the hydroid, is less important for taxonomic purposes " (than the hydroid). With this view, however, I cannot agree. I consider that both hydroid and medusa must be equally taken into consideration for taxonomic purposes.

Although it is not possible at present to obtain a complete and satisfactory classification, a revision, however, can be begun, and this paper is an attempt to revise the genus *Campanulina.*

THE GENUS *CAMPANULINA.*

The genus *Campanulina* was erected by van Beneden (1847) to take a small hydroid which he called *Campanulina tenuis.* He founded his genus on one character, namely, the web at the base of the tentacles of the hydranth, which he thought sufficient to distinguish his genus. His figure shows the webbed nature of the base of the tentacles but no trace of an operculum at the top of the hydrotheca. Indeed, his species is no " *Campanulina* " in the sense that other later authors (including van Beneden himself in 1866) have interpreted the genus. After seeing specimens sent to him by van Beneden, Alder (1862) stated that his *Laomedea acuminata* (originally described in 1857) and *C. tenuis* van Beneden were identical. A copy of van Beneden's original figure (1847, pl. i. fig. 6) is reproduced on p. 434. In 1866 van Beneden published a description of a hydroid which is almost certainly identical with Alder's original *Laomedea acuminata.* He regarded it as identical with the species he described in 1847, and called it *Campanulina tenuis.* A comparison of van Beneden's figures (1847 and 1866), however, indicates that he has described two very different species under the name *Campanulina tenuis.*

In 1864 Allman gives a new definition of *Campanulina,* and includes in it his *Campanulina* ? *repens,* although he expressed some doubt as to the suitability of including it in *Campanulina* on account of the absence of a web at the base of the tentacles of the hydranth and the liberation of a medusa with four tentacles.

Wright (1861) showed that the eggs of *Æquorea vitrina* Gosse developed into polyps which, he said, were indistinguishable from those of *Campanulina acuminata.*

Hincks (1868) accepted Allman's definition of *Campanulina,* and describes a new species, *Campanulina turrita.* The trophosome of this species is quite distinct from previously described species, but the medusa liberated from it was stated to resemble closely that of *Campanulina acuminata.* Between 1870 and 1897 three species of *Campanulina* were described; these were *Campanulina borealis* Thompson (1887), *Campanulina panicula* G. O. Sars, 1873, and *Campanulina hincksi* Hartlaub, 1897. Hartlaub also reared young polyps of "*Campanulina*" from *Eucheilota maculata* and from *Eutonina indicans.* He expressed the opinion that *Campanulina hincksi,* from which he obtained a young medusa, was the hydroid stage of *Eucheilota maculata.*

In 1898 Bonnevie described *Campanulina pedicellaris,* a species which from her description and figures is certainly not a *Campanulina* (sensu Allman and Hincks); it is almost certainly a species of *Stegopoma.* A year later (1899) Bonnevie redefined *Campanulina* to "embrace all such Campanularidæ as have their hydrothecæ furnished with a lid." Such a genus would include the genera *Stegopoma, Lovénella, Calicella,* and others, and would obviously be a retrogressive step. Fortunately this classification has not been adopted. Broch (1911) has referred *Opercularella lacerata,* a form indistinguishable from *Campanulina* but with fixed gonophores, to *Campanulina.* In this he has been followed by Kramp (1911, 1913, 1932) and by others.

Some authors, notably Stechow (1919 and 1923), have retained *Opercularella* for *Campanulina* hydroids with fixed gonophores. Kramp unites the two genera *Campanulina* and *Opercularella* on the grounds that the degree of development of the gonosome cannot be used as a generic character. It must be remembered, however, that *Campanulina* as it stands at present contains several medusa genera.

The position of a species with fixed gonophores thus becomes difficult to decide on account of the close resemblance of all *Campanulina* hydroids and because our knowledge of the structure and formation of the operculum is confined to one species, *Opercularella lacerata*. We are therefore faced with two alternatives—to place the species of *Opercularella* into the various medusa genera resulting from the dismemberment of *Campanulina*, or to retain *Opercularella* as a distinct genus for all species with fixed gonophores, and provisionally include in it many forms of which the gonosome is still unknown. I believe that the latter course, although open to criticism, is the one to be followed. It must, however, be understood that the provisional grouping together of these hydroids under *Opercularella* is largely a matter of convenience and is not intended as a natural classification; but in the present state of our knowledge of these hydroids it appears to be the least dangerous course to follow.

THE GENUS *OPERCULARELLA* HINCKS, 1868.

The genus *Opercularella* was founded by Hincks (1868) "for *Campanularia lacerata* Johnston, which is identical with *Campanulina*, so far as the trophosome is concerned, but differs from it widely in its mode of reproduction." For reasons already given it is my intention to retain *Opercularella* with *O. lacerata* as the genotype, and to include in the genus all *Campanulina* species with fixed gonophores and nearly all species of *Campanulina* whose gonosome is still unknown. Some of these will probably be found later to belong to medusa genera, and when they are known for certain they can then be removed from *Opercularella*.

The following species with fixed gonophores have previously been placed in *Opercularella*:—

Opercularella lacerata (Johnston, 1847).
Opercularella pumila Clark, 1876.
Opercularella nana Hartlaub, 1897 *.
Opercularella hispida Nutting, 1898.

Stechow (1921) has already placed *Campanulina* "*B*" Hickson and Gravely, 1907, in *Opercularella*, as *O. antarctica*.

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* The synonymy of the various species listed in this paper has been discussed only in so far as it has been necessary in the revision of the genus. *O. pumila* and *O. nana*, for example, are regarded as identical by many authors.

The following species, whose position is uncertain because of the lack of knowledge concerning the gonosome, are also placed provisionally in *Opercularella* :—

Campanulina belgicæ Hartlaub, 1904.
Campanulina birulai Linko, 1912.
Campanulina borealis Thompson, 1887.
Campanulina chilensis Hartlaub, 1905.
Campanulina humilis Bale, 1924.
Campanulina panicula G. O. Sars, 1873.
Leptoscyphus grigoriewi Mereschkowsky, 1878.

The last species, *Leptoscyphus grigoriewi*, was described by Mereschkowsky in 1878. He states that " The position I have assigned to the Hydroid, in the genus *Leptoscyphus*, is only provisional ; it might equally well be placed in the genus *Campanulina*, which only differs from *Leptoscyphus* in the gonophores, with which I am unacquainted here." My reasons for suppressing the genus *Leptoscyphus* are given on p. 441. I have therefore placed *L. grigoriewi* provisionally in *Opercularella*.

The genus *Opercularella* may be redefined as follows :—
Stem simple or branched, rooted by a filiform stolon. Hydrothecæ ovato-conic with a cleft or folded margin, the segments of which converge to form an operculum. Hydranths cylindrical, with a single whorl of filiform tentacles around a conical proboscis. Reproduction by means of fixed gonophores giving rise to planulæ.

THE GENUS *ÆQUOREA* PÉRON AND LESUEUR, 1809.

It has been shown by Rees (1938) that the medusa of the first adequately described species of " *Campanulina*," *Campanulina acuminata* (Alder), develops into a species of *Æquorea*. As already indicated, the *Campanulina tenuis* figured by van Beneden (1847 and 1866) are different species and even do not belong to the same genus. It is therefore necessary to restrict *Campanulina*, with *C. tenuis* van Beneden, 1847, as the sole species in the genus, because none of the subsequently described species are cogeneric with it. *Campanulina tenuis* van Beneden, 1866 (non 1847), appears, from the characters of the medusa, to be identical with *C. acuminata*, and I therefore list it as a synonym of this latter species. I place this species in the genus *Æquorea* * because its medusa is known to develop into an *Æquorea* medusa. There are several other species which can be referred to *Æquorea*, and when further research has been made into the life-history of these species it is very probable that the greater number of these hydroids can be linked to known medusæ, and then the oldest specific name will have to take priority. The following species—*C. acuminata* (Alder, 1857), *C. turrita* Hincks, 1868, *C. paracuminata* Rees, 1938, and *C. membranosa*—may be placed in *Æquorea.* The last-named hydroid was reared from the medusa *Æquorea victoriæ* Murbach and Shearer, 1903, by Strong (1925), who gave the polyps the name *C. membranosa*; it must henceforth bear the same name as the medusa. *C. rugosa* Nutting, 1901, which has a medusa stage, can be referred provisionally to *Æquorea*; so also can *C. pontica* Valkanov, 1935, which, from Valkanov's photographs, is almost certainly the hydroid of an *Æquorea,* so closely does it resemble *A. acuminata.*

Fraser (1911) has described a species of *Campanulina*, *C. forskalea,* which he thought was the hydroid of the medusa *Æquorea forskalea.* It is not certain whether this hydroid is really that of *Æquorea forskalea* Péron and Lesueur, and I therefore must regard it as a doubtful synonym of *A. forskalea.*

The genus *Æquorea* is redefined below to include the hydroid stage as well as the medusa stage :—

Æquoridæ with simple unbranched radial canals; subumbrella smooth, without rows of gelatinous papillæ †. Medusa liberated (where known), with deep bell-shaped umbrella; stomach short and quadrangular. Marginal vesicles adradial, eight in number.

Trophosome of the hydroid (where known). Stem simple or branched, rooted by a filiform stolon; hydrothecæ thin, membranous, sometimes finely striated longitudinally, elongate pod-shaped, more or less square below, and tapering to a fine opercular point above. Hydranths extensile, with a single whorl of filiform tentacles united at the base by a web. Gonothecæ very large, cylindrical, and smooth, borne on short stalks on the stem or on the stolon ; each gonotheca containing one (rarely two) medusa buds.

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* *Æquorea* Péron & Lesueur, 1809, has priority over *Campanulina* and also over *Wrightia* Agassiz, 1862.

† I have used the definition given by Kramp (1933) for the adult medusa.

OTHER SPECIES WITH "*CAMPANULINA*" HYDROIDS.

Campanulina repens Allman.

The hydroid, *Campanulina repens*, described and referred by Allman (1864) to *Campanulina*, does not even possess a web at the base of the tentacles of the hydranth—the chief character of van Beneden's genus. Its medusa also differs and does not even belong to the same family as the species of *Æquorea*. Browne (1905) has shown that the medusa liberated from this hydroid is the species which he described in 1896 as *Phialidium cymbaloideum* and which he identified with *Thaumantias cymbaloides* van Beneden, 1866. In 1902 Browne referred this medusa to his genus *Phialella*.

There is considerable divergence of opinion as to the name this species should bear. Browne (1905) expressed the opinion that certain species of medusæ figured by Forbes (1848) were probably stages in the life-history of this species, but regarded van Beneden's description as the first from which the species could be recognized, and accordingly adopts the specific name "*cymbaloides*." The various stages of this medusa were described under the names *Thaumantias quadrata*, *T. aeronautica*, *T. octona*, *T. maculata*, and *T. globosa* by Forbes, and although the figures are typical of this species no mention is made of the eight marginal vesicles found in the species. In other respects, however, the species appear to be identical. Mayer (1910) and Kramp (1933) are of this opinion ; Mayer used the specific name "*globosa*," the name given by Forbes to the adult medusa, but as Kramp (1933) has rightly pointed out the specific name "*quadrata*" has priority.

Haeckel (1879) erected a new genus, *Eucopium*, in which in the adult medusæ there are only four marginal tentacles, for a new species, *Eucopium primordiale*. He also included in the genus *Eucope picta* Keferstein & Ehlers (1861) and the stage described by Forbes as *T. quadrata*, which, being the youngest stage, has only four tentacles. This last species is not congeneric with the other two species in the genus. I select *Eucopium primordiale* as the genotype, and it is therefore necessary to remove *T. quadrata* from the genus. Dr. P. L. Kramp and Mr. F. S. Russell are in agreement with this.

Mayer (1910) adopted the generic name *Eucope* Gegenbaur, 1856, for this and allied medusæ, and at the same time states "The medusæ described by Gegenbaur under the generic name *Eucope* are probably young stages of *Clytia* and mature ones of *Obelia* and stages in the growth of *Phialidium*." Mayer's reconstituted genus, however, does not contain one of the species originally placed in the genus, and it is clear therefore that *Eucope* cannot be used for the present species. On this account I think it is best to use Browne's generic name *Phialella*, the specific name *quadrata* Forbes, 1848, having priority over *repens* Allman, 1864, and over *cymbaloides* van Beneden, 1866. Thus the name of both hydroid and medusa becomes *Phialella quadrata* (Forbes, 1848).

Allman (1859) described a small hydroid, *Laomedea tenuis*, from the Orkneys, and (in 1864) erected for it a new genus, *Leptoscyphus*. In forming his genus Allman attached too much importance to some *Lizzia* medusæ which he found free in the tube containing the hydroid. He believed that these had come from the gonothecæ of his hydroid, which did contain medusa buds. It is extremely unlikely, however, that these Anthomedusæ should come from a thecate hydroid, and it is very probable that it is, as Stechow (1923) has indicated, a species of *Campanulina*. Stechow has given it the name *Campanulina minuta*.

There is no web at the base of the tentacles, and a comparison of Allman's figure (reproduced by Hincks, 1868) with colonies of *Phialella quadrata* indicates that in all probability the species are identical. As there is, however, no figure of the medusa of *Leptoscyphus tenuis*, it must be regarded as a doubtful synonym of *Phialella quadrata*.

The genus *Phialella* Browne, 1902, may be defined as follows:—*Medusa.*—"Eucopidæ with eight adradial marginal sensory vesicles. Each with two or more otoliths and situated on the margin of the umbrella between two tentacles. Many tentacles. No marginal cirri. A gonad on each of the four radial canals. Stomach not on a peduncle " *.

Hydroid (where known).—Stem simple or branched, arising from a creeping stolon. Hydrothecæ conical or ovato-conic, with an operculum formed of distinct converging segments; hydranths tubular and extensile, with a whorl of filiform tentacles around a conical proboscis. There is no web. Gonothecæ large, oval or cylindrical, borne on stems and stolons.

Campanulina hincksi Hartlaub, 1897.

Campanulina hincksi and its young medusa was described by Hartlaub in 1897. He thought that the young medusa which he obtained from this hydroid was the youngest stage of a medusa, *Eucheilota maculata*, which he described in the same paper. Stechow (1921), realizing that this species was not cogeneric with other species then referred to *Campanulina*, proposed for it the generic name *Campomma*. In 1926 Kramp put forward the view that the medusæ obtained by Hartlaub from *C. hincksi* were not young stages of *Eucheilota maculata* as supposed by Hartlaub. Kramp came to this conclusion from a study of *Eucheilota* medusæ from Danish waters. Hartlaub's medusa from *C. hincksi* is liberated with four equally developed perradial tentacles, whereas the specimens examined by Kramp show transitional stages from two to four or more tentacles. At the time of publication of Kramp's paper only one species of *Eucheilota*, *E. maculata*, was known from N. European waters. Since then, however, a second species of *Eucheilota*, *E. clausa*, has been described by Russell (1936 *a* & *b*) from Plymouth, and the hydroid of this species, which is *Lovénella clausa*, is known to occur on the Danish coast (Kramp, 1935). Hartlaub found this medusa at Helgoland (see Russell, 1936 *a*).

From a careful comparison of the descriptions of the young stages described by Kramp (1926) and Russell (1936 *a* & *b*) I am inclined to think that the stages described by Kramp are *Eucheilota clausa*. It still remains to be proved, however, whether *C. hincksi* and *E. maculata* are identical, and for the present it is better to retain *Campomma* Stechow for this hydroid. If it can be shown that Hartlaub's surmise is correct, then *Campomma* will become a synonym of *Eucheilota* * and the specific name "*hincksi*" will have priority over "*maculata*" (page precedence).

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* I have included Browne's definition of his medusa genus, the type of which is *Phialella falklandica* Browne, 1902. The family Eucopidæ, however, requires considerable revision.

The young polyps reared by Hartlaub from *Eutonina indicans* and *Eucheilota maculata*, and referred by him to *Campanulina*, must take the same name as their medusæ.

The genus *Campomma* Stechow is defined below :—

Stems short, branched, or unbranched and ringed throughout. Hydrothecæ thin and membranous, of an oblong shape, with a pointed operculum. Hydranths long, cylindrical, with about twenty tentacles united at the base by a web. Gonothecæ narrow below and widening above, and arising from both stems and stolons. Each gonotheca with several medusa buds.

Medusa (at liberation). Umbrella deep bell-shaped, with four radial canals and four perradial tentacles; each tentacle with a cirrus at its base. There are four interradial cirri and eight adradial marginal vesicles. Further development unknown.

Genotype and sole species in the genus, *Campomma hincksi* (Hartlaub, 1897).

Campanulina ceylonensis (Browne).

Campanulina ceylonensis, the hydroid of the medusa *Eirene ceylonensis* Browne, was referred to the genus *Campanulina* by Annandale and Lloyd (1916). The hydrotheca of this hydroid has, it is true, an operculum, but the whole hydroid is unlike the usual type of hydroid which has been in the past referred to *Campanulina*. Superficially the hydroid is more like a *Cuspidella* than a *Campanulina*. It appears best for this hydroid to take the same name as the medusa.

Species of uncertain position.

Campanulina denticulata, described by Clarke (1907), has a kind of operculum, but the species appears to be more closely allied to *Calicella* than to *Opercularella*.

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* It is inadvisable to discuss the claims of *Lovénella* Hincks, 1868, until the hydroid of *Eucheilota maculata* is known for certain.

Campanulina producta was described by G. O. Sars (1873), and referred by him to *Calicella.* Hincks (1874) expressed the opinion that this species might prove to belong to the genus *Lovénella* Hincks, 1868. Later authors (*e. g.*, Kramp, 1935) have referred the species to *Lovénella*, but this arrangement must be regarded as provisional as the gonosome is still unknown.

ACKNOWLEDGMENTS.

I wish to thank Mr. F. S. Russell and Dr. P. L. Kramp for valuable suggestions.

Synopsis of Revision of the Genus Campanulina *van Beneden.*

Genus CAMPANULINA	*Campanulina tenuis* van Beneden, 1847.
Genus OPERCULARELLA Hincks, 1868.	*Opercularella lacerata* (Johnston, 1847).
	Opercularella pumila Clark, 1876.
	Opercularella nana Hartlaub, 1897.
	Opercularella hispida Nutting, 1898.
	Opercularella antarctica Stechow, 1921.
	Provisionally also :—
	Campanulina belgicæ Hartlaub, 1904.
	Campanulina birulai Linko, 1912.
	Campanulina borealis Thompson, 1887.
	Campanulina chilensis Hartlaub, 1905.
	Campanulina humilis Bale, 1924.
	Campanulina panicula G. O. Sars, 1873.
	Leptoscyphus grigoriewi Mereschkowsky, 1878.
Genus ÆQUOREA Péron & Lesueur.	*Campanulina acuminata* (Alder, 1857).
	Campanulina paracuminata Rees, 1938.
	Campanulina pontica Valkanov, 1935.
	Campanulina turrita Hincks, 1868.
	Campanulina rugosa Nutting, 1901.
	? *Campanulina forskalea* Fraser, 1911.
	and *Campanulina membranosa* Strong, 1925, as *Æquorea victoriæ* Murbach & Shearer.
Genus CAMPOMMA Stechow, 1921.	*Campanulina hincksi* Hartlaub, 1897.

Genus Phialella Browne, 1902.
Genus Eirene Eschscholtz, 1829.
Species of uncertain position:—
Campanulina repens Allman, 1864.
Campanulina ceylonensis.
Campanulina denticulata Clarke, 1907.
Campanulina producta (G. O. Sars, 1873).

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LIII.—*The Dipterous Genus* Cephaloconus *Walker* (*Family* Sapromyzidæ). By JOHN R. MALLOCH.

THIS genus has not been identified in recent years and was not listed by Hendel in his treatment of the family in 'Genera Insectorum.' In some material received recently from the British Museum I discovered two examples of Walkers' genotype, and having at the same time in my possession a specimen of *Ichthomyia cyprinus* de Meijere I found that the two species are apparently congeneric. The markedly conically produced face in both sexes, and similar structure of the thorax, legs, and wings, and even the identical colour of the latter, compel one to conclude that both species belong to the one genus. I append below some remarks on the Walker species, with a redescription and a synopsis for the distinction of the two species.

CEPHALOCONUS Walker.

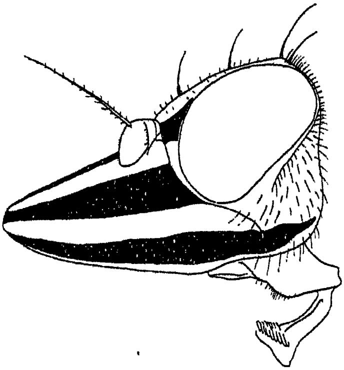
Proc. Linn. Soc. Lond. vol. v. p. 299 (1861).
Callistorhina Bigot, Bull. Ent. Soc. France, 1878, p. xxxiii.
Ichthomyia de Meijere, Nova Guinea, vol. ix. p. 382 (1913).

Frons with the typical two pairs of reclinate orbital bristles; antennæ moderate in length, the arista short-haired; face conically produced; thorax with three pairs of postsutural dorso-central and one pair of prescutellar acrostichal bristles; presutural present; intra-alar lacking; scutellum with four pairs of bristles; all tibiæ with a short preapical dorsal bristle; fore femur with fine comb-like series of hairs on apical half of the antero-ventral surface; setulæ on costal vein ending at apex of third vein.

Key to the Species.

A.	Face very much produced, the length in front of eye nearly twice as great as length of eye; a black dorsal vitta on face	*tenebrosus* Walker.
AA.	Face not so much produced, length in front of eye about equal to that of eye; no black dorsal vitta on face	*cyprinus* de Meijere.

Fig. 1.



Cephaloconus tenebrosus Walker.

Cephaloconus tenebrosus Walker.

Op. cit. p. 300.
Callistorhina vittigera Bigot, *op. cit.* p. xxxiv.

General colour and structure as in *cyprinus*, differing mainly in the longer head, which has a black dorsal vitta that is continued from vertex to apex of the facial cone.

Head (fig. 1) orange-yellow, the frons dull except on parts of ocellar region and near the orbital bristles, the entire face glossy. Frons with a broad central black vitta filling the interfrontal area that is divided by a central yellow line; parafacial with a deep velvety-black mark between antennal bases and eyes; face with five black vittæ, narrowed in front, the dorso-central one and the one on each side in centre connected at extreme tips; all bristles except the ocellars long and strong; antennæ and palpi yellow.

Thorax black, quite densely grey-dusted, the mesonotum with six faint dark vittæ, the outer two on each side partly confluent, and a deep velvety-black vitta on each lateral edge above which there is a yellow line, and below, on upper edge of the pleura, a much broader vitta along the underside of which there is a broad velvety-black vitta. Scutellum grey-dusted, blackened on each side. Sterno-pleurals 2, the anterior one short; scutellum subtriangular, not haired.

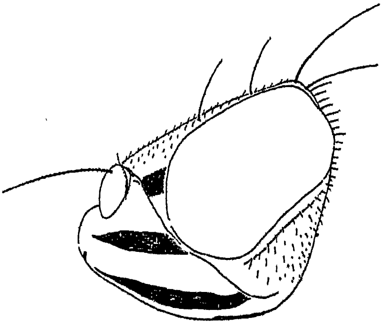
Legs black, tibiæ and tarsi orange-yellow.

Wings brownish black, becoming paler, subhyaline along hind margin. Inner cross-vein close to middle of discal cell; first posterior cell slightly narrowed apically. Halteres brownish yellow.

Abdomen black, slightly shiny, brownish apically on dorsum, without grey dusting.

Length 4·5 mm.

Papua: Mondo, 5000 feet, February 1934 (*L. E. Cheesman*). Originally described from Batjan (*Walker*) and Ternate (*Bigot*) *.



Cephaloconus cyprinus (de Meijere).

Cephaloconus cyprinus (de Meijere).

Op. cit.

The legs in this species are entirely yellow and the head is much shorter (fig. 2), with a black spot at apex of the cone above.

New Guinea.

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* There are two specimens from Byfield, C. Q., Queensland, Australia, coll. J. L. Froggatt, 29. iii. 26, in the British Museum.—JOHN SMART.

LIV.—*Tertiary Fossil Fishes from Maranhão, Brazil.*
By Sir ARTHUR SMITH WOODWARD, F.R.S.

[Plate XVI.]

DR. EUZEBIO DE OLIVEIRA, Director of the Geological and Mineralogical Service of Brazil, has favoured me with the opportunity of studying some fossil teleostean fishes collected by Mr. J. Borges from a Tertiary formation exposed in the left bank of the river Parnahyba at Nova York, Municipio of Pastos Bons, in the State of Maranhão, Brazil. In descending order the deposits are the following :—

1. Reddish sandy clay, 3 m. 60 cm. thick.
2. Conglomerate of regular pebbles embedded in sandy clay, 2 m. 50 cm. thick.
3. Dark green shale, becoming light grey after exposure, containing very numerous small fishes, the largest about 25 cm. long, associated with leaves, 80 cm. thick.
4. Dark grey sandy shale, sometimes light, with abundant impressions of leaves but few fishes, 30 cm. thick.
5. Dark green shale, becoming light grey after exposure, containing very numerous small fishes and a few leaves, 50 cm.+thick.

Knightia brasiliensis, sp. n. (Pl. XVI. figs. 1, 2.)

The most numerous fishes are very small herrings (the largest about 8 cm. long), which seem to be immature because the orbit is remarkably large, occupying more than one-third of the total length of the skull. The length of the head with opercular apparatus about equals the maximum depth of the trunk, and slightly exceeds one-quarter of the total length of the fish to the base of the caudal fin. The articulation of the mandible is below the middle of the orbit. No teeth have been seen. There are about 40 vertebræ, of which nearly half are caudal. The pelvic fins are inserted opposite the middle of the dorsal, and are a little nearer to the anal than to the pectorals. The dorsal and anal fins have each about 14 rays, but the dorsal is deeper and stronger than the anal. The caudal fin is deeply forked and is not covered with any scales. The scales are always obscure, so that it is uncertain whether they are serrated. The ventral median scutes are strongly keeled, and the series extends beyond the pelvic fins. There are also small dorsal median scutes without lateral wings, in series between the occiput and the dorsal fin; and one specimen, in which they are displaced by crushing, shows that they were supported by a series of bones like the supports of the median fins.

The fish thus described belongs to the section of the Clupeidæ, which Cope * originally distinguished under the generic name of *Diplomystus* on account of its dorsal scutes. He recognised several species from the freshwater Eocene Green River Shales of Wyoming, U.S.A.; and others have since been identified from the Cretaceous (and perhaps Eocene) of Brazil, from the Cretaceous of the Lebanon and Italy, from Lower Tertiary in Spanish Guinea, West Africa, and from the Oligocene and Miocene of Europe. Existing Clupeidæ, with the same dorsal scutes, have also been described under other generic names: *Potamalosa* † from the rivers of New South Wales, *Hyperlophus* † from the Australian coast, and *Ethmidium* ‡ from the seas off the coast of Chile and Peru. There is no doubt that several genera must be recognised, and Jordan § rearranged Cope's extinct species of *Diplomystus* under three generic names, *Diplomystus* proper, *Ellipes*, and *Knightia*. The new Brazilian fossil belongs to the last genus, and is evidently a hitherto unknown species, *Knightia brasiliensis*. It differs from *Ethmidium* in its fewer vertebræ (40 instead of 50) and in the shortness of the dorsal fin.

I have to thank Mr. J. R. Norman, of the British Museum, for references to the herrings existing in the freshwater of Brazil, and for comparing the new fossil with specimens of *Ethmidium*.

Macracara prisca, gen. et sp. n. (Pl. XVI. fig. 3.)

The fish shown slightly reduced in Pl. XVI. fig. 3, and a smaller specimen which I have had the opportunity of examining in detail, seem to represent an extinct genus and species of Cichlidæ. They are well preserved, but remarkably fragile and not easily prepared for study. The trunk is elongate-fusiform, with a stout caudal pedicle. The frontal profile of the skull is steep, and in no. 2 the deep triangular supraoccipital crest is seen to extend forwards to a point above the middle of the orbit. The articulation between the quadrate and the lower jaw is shown in no. 2 below the front edge of the orbit; and a few small conical teeth remain on the premaxilla among the fragmentary jaws of no. 1. The preoperculum in no. 2 exhibits a smooth edge, and the operculum in both specimens is covered with scales. There are a few stout branchiostegal rays, but the number is uncertain. There are about 16 vertebræ in the abdominal region, and probably 20 in the caudal region, where the last 3 or 4 are within the base of the caudal fin. In no. 1, below the position of the third and fourth vertebral centra, two downwardly directed processes seem to be the hypapophyses for the origin of the pharyngeal muscles. In no. 2 the middle abdominal vertebral centra are shown to be smooth, with one longitudinal lateral ridge; and the ribs do not extend more than two-thirds of the way towards the ventral border of the fish. The pectoral fin, which consists of about 10 rays, is inserted midway between the vertebral column and the ventral border, and the longest rays in no. 1 are as long as the head. The pelvic fin-spine in no. 2 is as long as the unjointed base of the first divided ray. The much extended dorsal fin begins above the insertion of the pectoral pair, and its spinous portion is more than twice as long as its soft portion. There are 16 stout smooth spines in close series, the foremost gradually increasing in length to the longest; and the directly following soft portion of the fin consists of about 10 rays. The anal fin arises opposite the hinder end of the spinous dorsal, and in both specimens it clearly shows three anterior spines which increase in length backwards, followed behind by 7 divided rays. No traces of scales occur on these fins. The shape of the stout caudal fin is uncertain. The scales are obscure, but some in no. 2 exhibit a deeply pectinated hinder border.

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* E. D. Cope, Bull. U.S. Geol. Surv. Territ. vol. iii. 1877, p. 808; also Rep. U.S. Geol. Surv. Territ. vol. iii. 1884, p. 74 (with figs.).

† J. D. Ogilby, Proc. Linn. Soc. N. S. Wales, vol. xxi. 1896, p. 504.

‡ W. F. Thompson, Proc. U.S. Nat. Mus. vol. l. 1916, p. 458; C. T. Regan, Ann. & Mag. Nat. Hist. [8] vol. xix. 1917, p. 302.

§ D. S. Jordan, "Description of a Collection of Fossil Fishes from the Bituminous Shales at Riacho Doce, of Alagôas, Brazil," Ann. Carnegie Mus. vol. vii. 1910, p. 23.

This new fossil fish evidently belongs to the same group of Cichlids as *Acara* and its allies, which are characterised by conical teeth, a preoperculum without serrations, a continuous dorsal fin, and an anal fin with three spines. It differs, however, from all genera in which the skeleton is known *, by having more numerous vertebræ, and from the elongate *Tæniacara* † by the more remote position of the anal fin, which arises opposite the end of the spinous dorsal. It may therefore be referred to a new genus and species, *Macracara prisca.*

Priscacara, from the Eocene Green River Shales of Wyoming, U.S.A., shows that the Cichlidæ date back to the Lower Tertiary in America, and *Knightia* is Lower Tertiary both in America and in the Old World. The fish-bearing deposit at Nova York in Maranhão is therefore of Tertiary age; and as both the genera now described are extinct, they may belong to the earlier rather than to the later Tertiary.

EXPLANATION OF PLATE XVI.

Fossil Fishes from a Tertiary Formation at Nova York, State of Maranhão, Brazil, about nat. size.

Figs. 1, 2. *Knightia brasiliensis*, sp. n.
Fig. 3. *Macracara prisca,* gen. et sp. n.

LV.—*Two new Gall Midges from* Sesamum angustifolium. By H. F. Barnes, M.A., Ph.D. (Entomology Department, Rothamsted Experimental Station).

In 1916 the Gingelly fly, *Asphondylia sesami* Felt, was originally described (Canad. Ent. xlviii. 1931, p. 31) from Indian specimens. This gall midge causes malformations in the blossoms, buds, and capsules of Sesame or Simsim, *Sesamum orientale* (*indicum*). Considerable loss of crop may result. More recently (Ann. & Mag. Nat. Hist. ser. 10, ix. 1932, p. 484) it was recorded from Uganda, where Mr. H. Hargreaves reared it in 1930 from both cultivated *Sesamum orientale* and a wild species,

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* C. T. Regan, " A Revision of the Fishes of the South-American Cichlid Genera *Acara, Nannacara, Acaropsis,* and *Astronotus,*" Ann. & Mag. Nat. Hist. [7] vol. xv. 1905, p. 329.

† G. S. Myers, " Four new Freshwater Fishes from Brazil, Venezuela, and Paraguay," Proc. Biol. Soc. Washington, vol. xlviii. 1935, p. 11.

S. angustifolium. The question was raised at that time as to whether this insect was a native of Africa or India.

In 1935 the writer was privileged to receive from the late Mr. A. H. Ritchie some midges which he had reared in July, 1935, from proliferated blossom and capsules of *S. angustifolium*, the wild African Simsim, at Nyakato, Bukoba, Tanganyika Territory.

One of these proved to be a *Trotteria* species, of which Mr. Ritchie wrote : "A bold Cecid. of silvery grey colour. It holds its hind legs characteristically in the air." This last remark obtains among the Cecidomyidæ only in the genus *Trotteria.* Other diagnostic characters of this genus are the relatively large eyes restricted to the basal portion of the head, the greatly produced basal antennal segment, and the long spines on the posterior tibiæ reminiscent of the Mycetophilidæ.

The other proved to be a species of the genus *Schizomyia.* Species in this genus are separated from other genera in the *Asphondylariæ* by possessing aciculate ovipositors, palpi of four segments, the terminal segments of the antennæ on the females being greatly shortened as in the genus *Asphondylia*, the seventh abdominal segment with a chitinized ventral sclerite, and the basal clasp segment of the male genitalia projecting well beyond the insertion of the terminal clasp segment. In Mr. Ritchie's experience this species emerged late from the Simsim material from which the *Trotteria* species had already emerged.

Curiously enough, Mr. Ritchie never mentioned finding any specimens of the Gingelly fly itself. Usually when *Trotteria* species have been found they are associated with other gall midges, for example, with species of the genera *Kiefferia* and *Asphondylia.* To a less extent *Schizomyia* species are associated with *Asphondylia* species. The *Trotteria* species have on occasion been claimed to be predaceous, while the *Schizomyia* species are thought to be inquilines in the galls of the *Asphondylia* species.

It would appear, therefore, that the same association occurs on Sesame. It might be postulated that finding these two associated gall midges in Africa is evidence that the Gingelly fly is native to Africa and not India. This is supported by Hiltebrandt's view that Africa is the primary centre of origin of Sesame.

The two species of midges discovered by Mr. Ritchie are described below as *Trotteria sesami*, sp. n., and *Schizomyia sesami*, sp. n.

Trotteria sesami, sp. n.

Male.—Length 1·5–2 mm. Antennæ: 2+12, 2+17, 2+19 and 2+20; the scape segment about three times as long as broad; flagellar segments very similar to those in the genus *Lasioptera*, nearly transverse, with practically no neck, the 3rd flagellar segment just about as long as broad, the terminal segment in some specimens evidently composed of two segments only partially differentiated. Eyes limited to basal half of head, facets widely separated vertically, connected by a narrow band of pigment. Palpi: four segments, proximal segment small quadrate, 2nd nearly three times as long as broad, 3rd same length but slightly narrower, terminal segment about same width as 3rd but slightly longer. Thorax and abdomen dark brown, abdomen at least with silvery scales ~~when~~ alive. Wings: subcosta very short; costa, subcosta and 3rd vein covered with scales; 3rd vein clearly separated from costa and subcosta, moderately curved and reaching two-thirds the length of wing; 5th and 6th veins free. Legs: posterior femora swollen, posterior tibiæ with one or more long spines; claws bifid, slightly longer than empodium. Genitalia: brown, basal clasp segment long, narrow, about three-and-a-half times as long as broad; distal clasp segment slightly swollen at base, constricted towards the tip; dorsal lamella deeply bilobed, each lobe broadly rounded, with a few long setæ; ventral lamella entire, rounded, about the same length but slightly narrower than a single lobe of dorsal lamella; harpes nearly twice as long as lamellæ.

Cotypes, Cecid. 2602–5 inclusive.

Female.—Length 1·5–2 mm. Antennæ: 2+18, 2+21, 2+22, $2+\left\{\begin{matrix}13\\14\end{matrix}\right\}$; the scape segment nearly four times as long as broad; each flagellar segment transverse, with practically no neck. Palpi: about as in male. Ovipositor very extensile, needle-shaped. Other characters as in male.

Cotypes, Cecid. 2606–9 inclusive.

Habitat.—Proliferated blossom and capsules of *Sesamum angustifolium*, in company with *Schizomyia sesami*. Nyakato, Bukoba, Tanganyika Territory.

Larvæ.—Bilobed breast-bone, pointed lobes, widely separated.

Cecid. 2633–5 inclusive.

Schizomyia sesami, sp. n.

Male.—Length 1–1·5 mm. Antennæ: 2+12, unicolorous, flagellar segments elongated, cylindrical with short necks, sinuous circumfila loosely attached, 3rd flagellar segment about three times as long as broad, terminal segment tapering, about four times as long as broad at proximal end. Palpi: proximal segment quadrate, 2nd just longer, about same width, 3rd about twice as long as 2nd and slightly narrower, about five times as long as broad, terminal segment slightly longer than 3rd and slightly narrower, about six times as long as broad. Wings: hyaline, 3rd vein reaching margin just at tip of wing. Legs: hairy, unicolorous, paler than abdomen and considerably paler than thorax which is brown; claws simple, moderately curved, slightly longer than empodium. Genitalia: basal clasp segment slender, with small finger-shaped accessory lobe basally as in *S. manihoti* Tav., ventral prolongation setose, conspicuous, almost as long as distal clasp segment and with long setæ, much longer than in *S. stachytarphetæ* Barnes; distal clasp segment subapical with dark area distally and ventrally; dorsal lamella bilobed, deeply incised, each lobe rounded; ventral lamella shorter, broad V-shaped incision, each lobe almost pointed, small.

Cotypes, Cecid. 2618–21 inclusive.

Female.—Length 1·5–2 mm. Antennæ: 2+12, unicolorous, 3rd flagellar segment about three-and-a-half to four times as long as broad, three distal segments tapering rather abruptly, as in *Asphondylia*, terminal segment globular. Palpi: about as in male. Abdomen with dark scales. Ovipositor typical *Schizomyia* type. Otherwise about as in male.

Cotypes, Cecid. 2622–2625 inclusive.

Habitat.—Proliferated blossom and capsules of *Sesamum angustifolium*, in company with *Trotteria sesami*. Nyakato, Bukoba, Tanganyika Territory.

LVI.—*Twenty-four new Generic Names in Orthoptera.*

By B. P. Uvarov, D.Sc., British Museum (Natural History).

The preparation of a list of generic names in Zoology for the "New Nomenclator," by Dr. S. A. Neave, revealed that a large number of Orthopterous genera bear the names that are preoccupied, and should be replaced. The present paper treats twenty-nine such names, beginning with the letters A, B, and C, which are contained in the first volume of the "New Nomenclator," to be published shortly. In the case of five genera out of that number, no new names are proposed, since either an alternative generic name is already available, or the genus itself is considered synonymous with another one. These cases suggest that the re-naming of genera should be done only by a specialist in the group, as otherwise some entirely superfluous names would be introduced. To avoid such unnecessary re-naming, I abstain from replacing some preoccupied names of fossil Orthoptera, the generic classification of which is very confused. I also do not propose new names for those that appear to be preoccupied by emended or misprinted names, which I consider not valid in any case.

Further groups of new names will be published as the work on the "New Nomenclator" advances.

Acra Brunner, 1878 (Tettigoniidæ), preoccupied by *Acra* Bleeker, 1863 (Pisces), re-named **Acropsis**, n. n.

Adolfia Rehn, 1914 (Acrididæ), preoccupied by *Adolfia* Guerich, 1909 (Brachiopoda), re-named **Rehnula**, n. n.

Ægipan Scudder, 1877 (Tettigoniidæ) is preoccupied by *Ægipan* Rafinesque, 1815 (Mammalia), but an earlier name *Arethæa* Stål, 1876, is available and used for the genus.

Agaura Brunner, 1891 (Tettigoniidæ), preoccupied by *Agaura* Burmeister, 1873 (Aves), re-named **Agaurella**, n. n.

Allactina Hebard, 1929 (Blattidæ), preoccupied by *Allactina* Curran, 1924 (Diptera), re-named **Hebardula**, n. n.

Amuria Brunner, 1893 (Tettigoniidæ), is preoccupied by *Amuria* Staudinger (Lepidoptera), but is itself not a valid name since no species were included into it at the time of description. It became valid in 1914 when Pylnov described the first species under it, but *Atlanticus* Scudder, 1894, has been described in the meantime and *Amuria* became its synonym. Therefore, no new name is required (see Uvarov, Trans. Ent. Soc. London, 1924, p. 511.)

Amycus Stål, 1875 (Acrididæ), preoccupied by *Amycus* Koch, 1846 (Arachnida), but a later name *Parga* Walker, 1870, is available and used for the genus.

Aprion Serville, 1839 (Tettigoniidæ), preoccupied by *Aprion* Cuvier et Valenciennes, 1830 (Pisces), re-named **Anaprion**, n. n.

Ariasa I. Bolivar, 1912 (Acrididæ), preoccupied by *Ariasa* Distant, 1905 (Hemiptera), re-named **Ariasius**, n. n.

Bactridium Saussure, 1868 (Phasmidæ), preoccupied by *Bactridium* Reuss, 1848 (Bryozoa), and by *Bactridium* Leconte, 1861 (Coleoptera), re-named **Bacillidium**, n. n.

Balboa Hebard, 1927 (Tettigoniidæ), preoccupied by *Balboa* Distant, 1893 (Hemiptera), re-named **Balboana**, n. n.

Batrachopus Blanchard, 1851 (Acrididæ), preoccupied by *Batrachopus* Hitchcock, 1845 (Amphibia), and by *Batrachopus* Goldfuss, 1814 (Pisces), re-named **Batrachacris**, n. n.

Beesoniella Werner, 1935 (Mantidæ), preoccupied by *Beesoniella* Lallemand, 1923 (Hemiptera), re-named **Beesonula**, n. n.

Benoistia Chopard, 1920 (Gryllidæ), preoccupied by *Benoistia* Cossmann, 1900 (Mollusca), re-named **Benoistella**, n. n.

Beta Brunner, 1893 (Acrididæ), preoccupied by *Beta* Saussure, 1855 (Hymenoptera), but the genus is known by an earlier name *Phlibostroma* Scudder, 1875.

Bolivarita Hebard, 1933 (Tettigoniidæ), preoccupied by *Bolivarita* Escalera, 1914 (Coleoptera), re-named **Bolivariola**, n. n.

Brachyrhamphus Carl, 1915 (Phasmidæ), preoccupied by *Brachyrhamphus* Bertoni, 1901 (Aves), and *Brachyrhamphus* Brandt, 1837 (Aves), re-named **Carlius**, n. n.

Brunnea Brunner, 1895 (Tettigoniidæ), preoccupied by *Brunnea* Dupont, 1834 (Pisces), re-named **Brunneana**, n. n.

Bufotettix Uvarov, 1929 (Acrididæ), preoccupied by *Bufotettix* Caudell, 1918 (Tettigoniidæ), re-named **Batrachacris**, n. n.

Caledonia Willemse, 1923 (Acrididæ), preoccupied by *Caledonia* Cambridge, 1824 (Arachnida), re-named **Caledonula**, n. n.

Camposia I. Bolivar, 1909 (Acrididæ), preoccupied by *Camposia* Leach, 1823 (Crustacea), re-named **Camposacris**, n. n.

Carlia Uvarov, 1929 (Acrididæ), preoccupied by *Carlia* Meek, 1914 (Pisces), and *Carlia* Gray, 1845 (Reptilia), re-named **Carliola**, n. n.

Catreus Stål, 1878 (Acrididæ), preoccupied by *Catreus* Cabanis, 1851 (Aves), re-named **Catreolus**, n. n.

Cecidophaga Karny, 1921 (Tettigoniidæ), preoccupied by *Cecidophaga* Walsingham, 1911 (Lepidoptera), re-named **Cecidophagula**, n. n.

Chelidoptera Wesmael, 1838 (Tettigoniidæ), is preoccupied by *Chelidoptera* Gould, 1836 (Aves), but no new name is necessary since *Chelidoptera* Wesmael is a synonym of *Decticus* Serville (see Uvarov, Trans. Ent. Soc. London, 1924, p. 528).

Corycus Saussure, 1861 (Tettigoniidæ), preoccupied by *Corycus* Cuvier, 1814 (Pisces), re-named **Corycoides**, n. n.

Cratonotus I. Bolivar, 1881 (Tettigoniidæ), preoccupied by *Cratonotus* Distant, 1879 (Hemiptera), re-named **Cratonotideus**, n. n.

Culama Walker, 1868 (Blattidæ), preoccupied by *Culama* Walker, 1856 (Lepidoptera), re-named **Culamana**, n. n.

Cyrtonota Hanitsch, 1929 (Blattidæ), preoccupied by *Cyrtonota* Simon, 1864 (Arachnida), re-named **Cyrtonotula**, n. n.

LVII.—*On the Aquatic Coleoptera of the New Hebrides and Banks Islands.* Dytiscidæ, Gyrinidæ, *and* Palpicornia.

By J. Balfour-Browne, M.A., F.Z.S., F.R.E.S., from the British Museum (Natural History).

So far as I am able to discover, the recorded aquatic coleopterous fauna of the New Hebrides comprises but two species of Dytiscidæ, both of which have a widespread distribution in the Australasian Region. The collection forming the material for this paper was mostly taken by Miss L. E. Cheesman, in 1929 and 1930, to whose indefatigable collecting in Polynesia and Melanesia we owe much of our knowledge of these regions. The whole collection is deposited in the British Museum (Natural History).

GEOGRAPHICAL POSITION.

The group of eleven larger and many smaller Islands forming the New Hebrides lies about 900 miles off the Queensland coast of Australia, rather north-east and outside of New Caledonia, about 150 miles between Tanna in the New Hebrides and the Loyalty Islands, and 250 miles between Tanna and New Caledonia proper. North-westward the group is connected through the Banks Islands and Santa Cruz Islands with the Solomon Islands, about 450 miles away. Through the Solomons there is a connection with the Bismark Archipelago and New Guinea.

Eastwards of the New Hebrides, about 600 miles away, lie the Fijian Islands of Macronesia, and beyond them the Samoan Islands and the Tonga Islands, together here called the Fijian group.

It is of interest to proceed from the geographical position to a discussion and analysis of the fauna.

FAUNISTIC RELATIONSHIP.

Dytiscidæ.

The collections comprise eight species included in seven genera, of which three species are new to science.

Of the five known species one, *Cybister tripunctatus hamatus* (Montr.), is of general distribution; one, *Canthydrus serialis* Fauvel, is otherwise only known from New Caledonia; two, *Rantus annectens* Sharp and *Hydaticus fijiensis* Régimb., are Fijian; the remaining species, *Copelatus gentilis* Sharp, is Papuasian. Of the three new species hereinafter described, *Bidessus cheesmanæ*, sp. n., is related to an Australian form; *Copelatus cheesmanæ*, sp. n., has its affinities with New Caledonian species, and the third, *Platynectes insularis*, sp. n., has also been identified from the Solomon Islands.

The other recorded species, *Hydaticus consanguineus* Aubé (*adumbratus* Clark), is not present in the collections but is known from Papua, New Caledonia, Oceania, and

Australia, and was described by Clark from Espiritu Santo.

Of the nine species of Dytiscidæ present, only two, therefore, are endemic.

Gyrinidæ.

The only species present, *Dinuetus* (*Cyclous*) *australis* (Fabricius), is of general distribution throughout Australasia.

Palpicornia.

Twelve species, included in nine genera are present, of which two species are new to science.

Of the ten known species five, *Cœlostoma fabricii* (MacLeay), *Dactylosternum dytiscoides* (Fabricius) and *D. subquadratum* (Fairmaire); *Helochares pallens* (MacLeay), and *Sternolophus marginicollis* Blackburn, are of general distribution; one, *Merosoma eremita* (Knisch), is found in the Solomon Islands, Bismark Archipelago, and New Guinea; two, *Hydræna princeps* Fauvel and *Hydrophilus australis* Montrouzier, are also found in New Caledonia; one, *Enochrus artensis* (Fauvel) is found in New Caledonia and Queensland; and one, *Enochrus esuriens* (Walker), is found in the Banks Islands and Oceania and Indo-Malay region.

Of the two new species one, *Omicrogiton cheesmanæ*, sp. n., belongs to a genus chiefly known in the Indo-Malay sub-region, but one species has been recorded from Buru in the Melanesian sub-region; the other, *Enochrus cheesmanæ*, sp. n., is also found in the Banks Islands.

There is thus only one truly endemic species present, but the Banks Islands cannot be separated from the New Hebrides as a faunistic entity, so the actual total of endemic forms amounts to two. Table I. is an endeavour to simplify the foregoing discussion. For this purpose "Papuasia" comprises New Guinea, the Bismark Archipelago and Solomon Islands; the Fijian group comprises Fiji, Wallis de Uvea, Tonga and Samoa.

There is little doubt that this collection accounts for only a small portion of the aquatic coleopterous fauna since, as may be seen in Table II., the neighbouring

TABLE I.

	Endemic.	Papuasian.	New Caledonian.	Australian.	Fijian.	General.	Total species.
Dytiscidæ	2	2	1	..	2	2	9
Gyrinidæ	..	..	..	..	..	1	1
Palpicornia	2	1	2	1	..	6	12
Totals	4	3	3	1	2	9	22

TABLE II.

Faunistic areas.		Oceanian.	Fijian.	New Hebridean.	New Caledonian.	Solomons.	Papuan *.	Queensland.	New Zealand.
Dytiscidæ.									
Genera and sub-genera.	Total ...	7	8	7	14	5	18	23	9
	Endemic.	0	0	0	0	0	0	0	1
Species and sub-species.	Total ...	9	16	9	27	7	62	74	16
	Endemic.	5	7	2	14	1	30	19	12
Gyrinidæ.									
Genera and sub-genera.	Total ...	0	2	1	4	3	8	5	2
	Endemic.	0	1	0	0	0	2	0	0
Species and sub-species.	Total ...	0	4	1	5	4	30	8	2
	Endemic.	0	3	0	3	3	25	1	0
Palpicornia.									
Genera and sub-genera.	Total ...	10	13	9	16	2	17	20	26
	Endemic.	0	1	0	2	0	2	1	19
Species and sub-species.	Total ...	20	19	13	25	3	37	43	64
	Endemic.	4	5	2	11	0	21	12	59
Total of species and subspecies.	Total ...	29	39	23	57	14	129	125	82
	Endemic.	9	15	4	28	4	76	32	71
Percentage endemicity		32%	38%	17%	49%	31%	59%	26%	86%

* Provisional only. The identification of Miss Cheesman's collections is not yet completed.

areas are from two to six times as rich, even on our present incomplete knowledge.

As will be seen in Table II., the percentage endemicity of this group is very low in proportion to the neighbouring areas, but before a discussion can be entered into, it is necessary to make it clear that the high rate of 86 per cent. endemicity for New Zealand is due to the presence of the *Rygmodini* tribe of Hydrophilidæ, s. str., which, until recently, was believed to be endemic to New Zealand. This tribe accounts for no fewer than 52 of the 64 species of Palpicornia recorded from New Zealand.

The rate of 27 per cent. from the Solomon Islands also is largely artificial, since very few species are known from these Islands.

These two excluded, the rate of 17 per cent. for the New Hebrides is very low, and is either due to the fact that the more common species only were collected and that these are of more widespread distribution (*i. e.*, the endemicity rate is artificially low), or, alternatively, that the geographical position of the islands lays them open to a more continuous degree to invasion from the neighbouring areas (*i. e.*, the endemicity rate will be naturally low). Unfortunately, the collection is of no assistance in assessing which explanation is the more probable, and an answer must be deferred until more extensive material has been obtained. There is not enough evidence available as to the distribution within the group in relation to the distribution and frequency throughout the other areas to clarify a faunistic analysis and indicate from which direction the aquatic coleopterous fauna has arrived, and enquiry along these lines is greatly to be desired in any future investigation of the group.

SYSTEMATIC.

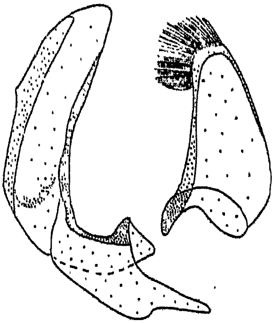
Dytiscidæ.

1. *Canthydrus serialis* Fauvel, 1883, Rev. d'Ent. ii. p. 336.

A fair series of this little species, described from near Noumea, New Caledonia. It is compared with *C. guttula* Aubé by Fauvel, but is more convex, rather less elongate, and comes closer to *C. bovillæ* Blackburn. It is readily recognized by the sub-shining surface and the large punctures of the elytral series.

New Hebrides : Malekula*, N.E., vi. 1929, 11 specimens ; Santo, viii. 1929, 7 specimens. Banks Islands : Gaua, " Hot springs," 20. xii. 1933, 1 specimen (*J. R. Baker* leg.).

Fig. 1.



Canthydrus serialis Fauvel.
Ædeagus and left paramere. × 50.

2. *Bidessus cheesmanæ*, sp. n.

Oblongo-ovalis, postice attenuatus, parum convexus, nitidulus, rufo-flavus : capite flavo, postice leviter infuscato, tenuissime irregulariter punctulato ; pronoto flavo, lateribus leviter rotundatis, utrinque ad basin plicâ rectâ ad medium attingentibus, in elytris continuatis, tenue parce punctulato, ad basin inter plicæ fortiore ; elytris rufo-flavis, maculis obscuris post basin et ad medium, sat dense et forte punctatis, ad latera obsoletiore, striâ suturali nonnullâ ; subtus rufoflavus, coxis posticis obsolete punctatis ; antennis pedibusque rufo-flavis.

Long. 2·09–2·36 mm. ; lat. 1·0–1·22 mm.

New Hebrides : Malekula, N.E., vi. 1929, holotype ♂, allotype ♀, and 5 paratypes ; Erromanga, viii. 1930, 3 specimens (immature).

This new species belongs to the group, dominant in the Australasian Region, characterized by the absence of a sutural stria. It is most nearly related to *B. amabilis* (Clark) and *B. skottsbergi* Zimmermann (from Easter Island) by the almost straight plicæ, but it is easily distinguishable by the smaller size and more dilated pronotum and coarser elytral punctuation.

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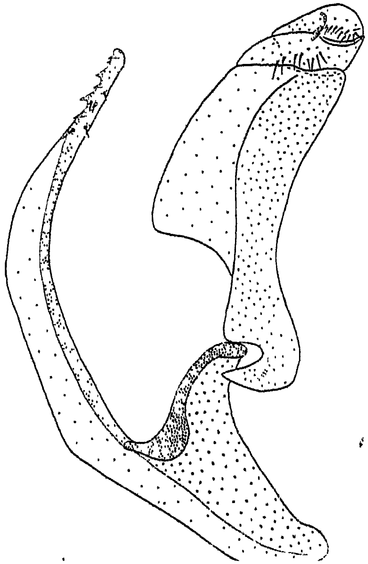
[*] Localities are all from Miss Cheesman's collection unless otherwise stated.

The individuals from Erromanga are immature and of a pure straw-yellow colour, showing, on the elytra, brownish patches (one basally between the plicæ, slightly prolonged at each posterior corner and along the suture towards a discal half-moon shaped patch with the convexity anterior; from the outer anterior edges of this stretch forwardly-directed bands which have a dilation at the extremity, this may extend to the basal patch enclosing a pale area), which are present in the mature individuals but very obscure. This type of maculation is an almost constant feature in the genus.

Fig. 2.



Bidessus cheesmanæ, sp. n.
Ædeagus and paramere, lateral view. × 100.

3. *Copelatus cheesmanæ* J. Balfour-Browne, 1939, Trans. R. Ent. Soc. Lond. lxxxviii. p. 75, figs. 8, 9 *b*.

This species is very similar to *C. aubei* (Montr.) from New Caledonia, but differs by the less impressed strioles of the head and pronotum and the more broken and discontinuous elytral striæ. The submarginal stria is usually not present, but when it is present it is punctiform. I include the species in group VII.

NEW HEBRIDES: Malekula, N.E., vi. 1929, holotype ♂, allotype ♀, and 2 ♂♂ paratypes; Malekula, Malua Bay, vi. 1929, 4 ♀♀ paratypes; Malekula, i. 1930, 2 ♂♂, 2 ♀♀ paratypes. BANKS ISLANDS, Vanua Lava, x. 1929, 1 ♂, 1 ♀ paratypes.

4. *Copelatus gentilis* Sharp, 1882, Trans. Roy. Dublin Soc. (2) ii. p. 581.

A good series of this species described from a unique female from Batchian. It is also recorded from Ternate, and I have seen specimens from Dorey, New Guinea, and North Queensland.

NEW HEBRIDES: Malekula, i. 1930, 6 ♂♂, 1 ♀ specimens; Malekula, N.E., vi. 1929, 1 ♂, 2 ♀♀ specimens; Malekula, Ounua, iii.–iv. 1929, 3 ♀♀ specimens.

Copelatus gentilis ab. *divisus* J. Balfour-Browne, 1939, *loc. cit.*, p. 79.

This aberration resembles *C. fuscipennis* Sharp very closely, but may be recognized by the rather broader and shorter form, the better impressed elytral striæ and the larger area of strigulation at the posterior pronotal angles.

NEW HEBRIDES: Malekula, i. 1930, ♂ holotype and 1 ♂ paratype.

5. *Platynectes insularis*, sp. n.

Ovalis, postice attenuatus, depressus, niger, nitidus; capite nigro, antice, maculâ in medio et maculis duabus in vertice rufo-flavis; pronoto nigro, angulis anticis plus minusve rufo-flavis, elytris nigris, maculâ sublaterali rotundatâ paulo post medium, maculâ geminatâ subapicali, et lineâ sublaterali a medio usque ad apicem, flavis; subtus niger vel rufo-niger, processis prosternali metasternalique rufis, epipleuris rufis, antennis pedibusque quattuor anterioribus rufis, pedibus posterioribus rufo-fuscis. Mas, segmento subto ultimo abdominis utrinque vix longitudinaliter rugoso. Long. 5·91–6·27 mm.; lat. 3·0–3·36 mm.

BANKS ISLANDS: Vanua Lava, x. 1929, holotype ♂, allotype ♀, and 18 paratypes. NEW HEBRIDES: Malekula, iv. 1930, 1 paratype; Malekula, Malua Bay, vi. 1929, 1 paratype; Erromanga, vii. 1930, 1 paratype; Tanna, x. 1930, 1 paratype; Aneityum, xi. 1930, 8 paratypes. SOLOMON ISLANDS: Santa Ana, 1 ♂, 1 ♀ paratypes (*R. J. A. W. Lever* leg.).

It is only with reservations that I am prepared to describe this small *Platynectes* as a new species. I am by no means certain that the *Platynectes decempunctatus* of Authors and its numerous described variations are the same as the true *P. decempunctatus* (Fabricius), of which I have seen two specimens (types) in the Banks collection, and three specimens, exactly comparable, from the Lizard Islands, Queensland, Australia. The size of these five specimens averages 6·92 × 3·59 mm. The average size of ten specimens taken at random from among upwards of 200 specimens of *P. decempunctatus* auctt. and its varieties, excluding *P. semperi* Rég., which I have not seen, is 8·16 × 4·1 mm., with extremes of 7·25 × 4·09 and 9·27 × 5·12 mm. There are, therefore, three size-groups, on average sizes :—

(i.) 6·09 × 3·18 mm. *P. insularis*, sp. n.
(ii.) 6·92 × 3·59 mm. *P. decempunctatus* (Fabricius).
(iii.) 8·16 × 4·10 mm. *P. decempunctatus* auctt.

which are quite sharply delimited and apparently rarely crossed. The described length of *P. semperi* comes much below that of *P. decempunctatus* auctt., and in fact falls in the range of *P. insularis*. This suggests to my mind that the species is wrongly interpreted and may perhaps be fully valid. I am granting specific status to the new form described above on the grounds of its small size, although it may be only a small dark form of *P. decempunctatus* (Fabricius). The ædeagal form varies slightly through the complex, but is of little practical use. Until intermediate sizes are recognized, I propose to treat the three size groups as valid species with the following synonymy :—

(i.) **Platynectes insularis**, sp. n.
(ii.) **Platynectes decempunctatus** (Fabricius, 1775) (non auctt.).
    decastigma Régimbart, 1899.
(iii.) **Platynectes octodecimmaculatus** (MacLeay, 1825).
    decempunctatus Régimbart, 1899, auctt. (non Fabricius).
    ab. **flavoscriptus** Zimmermann, 1917 (1919).
    var. *octodecimmaculatus* Régimbart, 1899 (non MacLeay).

forma col.* **polygrammus** Régimbart, 1899.
decempunctatus, 2nd form, Sharp, 1882.
forma col. **variegatus** Régimbart, 1899.
forma col. **lugubris** (Blanchard, 1853).
decempunctatus, 1st form, Sharp, 1882.
forma col. **spilopterus** (Germar, 1848).
mastersii (MacLeay, 1871).
decempunctatus, 3rd form, Sharp, 1882.

This new species resembles a very small and narrow example of *P.* 18-*maculatus* forma col. *spilopterus* (Germ.) in the colour-pattern and reticulation, but, apart from the smaller size, it may be immediately recognized by the more attenuate form. The apical ventral sternum in the male has only one or two longitudinal rugosities on each side, whereas in *P.* 10-*punctatus* (Fab.) the apical sternum is quite smooth and shining in the three males I have seen, and in *P.* 18-*maculatus* (MacLeay) this sternum is profusely and rather coarsely rugose. In the male paratype from the Solomon Islands this sternum is much more profusely rugose than in the New Hebrides specimens, but less so than in *P.* 18-*maculatus* (MacLeay), so that there is some local variation.

The flavous spots of the elytra are very variable, in some cases large and round, in others more or less geminate, and in some specimens from Aneityum they have quite disappeared, but the sublateral stripe is always present.

6. *Rantus annectens* Sharp, 1882, Trans. Roy. Dublin Soc. (2) ii. p. 608.

A good series of this species originally described from Samoa, and later identified by Zimmermann as *R. suturalis* (*pulverosus* Steph.) (MacLeay). It is readily distinguished from that species by the anterior tarsal claws in the male being simple and alike. So far as I have seen specimens, *R. suturalis* occurs in New Caledonia to the exclusion of *R. annectens*.

NEW HEBRIDES: Malekula, Ounua, ii. 1929, 7 specimens; Ounua, iii.–iv. 1929, 2 specimens; Malua Bay, vi. 1929, 15 specimens; Erromanga, vii.–viii. 1930, 13 specimens. BANKS ISLANDS: Gaua, 19. xii. 1933, "Hot springs" (*J. R. Baker* leg.).

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* Owing to the looseness with which the term "variety" is habitually used, I am replacing it with "forma coloris" for colour variations.

7. *Hydaticus fijiensis* Régimbart, 1899, Ann. Soc. Ent. Fr. lxviii. p. 316.

A fair series of specimens of this species, hitherto only recorded from Fiji and Tonga. The New Hebridean series shows some variation in colour, but is generally darker than specimens from the other two localities.

NEW HEBRIDES: Malekula, Ounua, ii. 1929, 7 specimens; Malua Bay, vi. 1929, 8 specimens; Malekula, N.E., vii. 1929, 1 specimen; Erromanga, viii. 1930, 2 specimens; Tanna, x. 1935, 2 specimens (*P. A. Buxton* leg.).

8. *Cybister tripunctatus hamatus* (Montrouzier), 1857, Ann. Soc. Agr. Lyon, vii. p. 9.

NEW HEBRIDES: Malekula, N.E. vii. 1929, 2 ♂♂, 1 ♀ specimens.

Gyrinidæ.

9. *Dineutus* (*Cyclous*) *australis* (Fabricius), 1775, Syst. Ent. p. 235.

NEW HEBRIDES: Erromanga, viii. 1930, 11 specimens

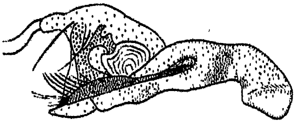
Palpicornia.

10. *Hydræna* (s. str.) *princeps* Fauvel, 1903, Rev. d'Ent. xxii. p. 350.

I attribute these specimens to Fauvel's species, described from a unique from New Caledonia and apparently not since taken, with little hesitation. They agree well with the description except for the form of the penultimate sternum, described as "prælongo, conico, lævi, apice medio parum emarginato." This indicates that the holotype is a male.

In the specimens before me the anterior tibiæ of the male have a small dilation on the inner edge very close to the extremity; the posterior tibiæ of the males are furnished with a row of long silky hairs on the inner side over the posterior two-thirds; and the fifth and sixth abdominal sterna are rather prominent, the sixth a little elongate and almost glabrous, shining, with an effaced reticulation: the apical margin has a small shallow impression in the middle which suggests a shallow emargination, but the edge is entire. The fifth sternum is glabrous only over the posterior two-thirds, more shining and more obsoletely reticulate than the sixth. In the female the anterior and posterior tibiæ are simple, the last two abdominal sterna not prominent, the sixth not elongate; the fifth is shining over the posterior two-thirds, without a dense hydrofugal pubescence but with numerous long hairs; the sixth is glabrous, dull, with a strong reticulation, and the apical margin either narrowly coarsely rugosely punctate or provided with short adpressed setæ. The metasternum in both sexes has a pair of shining patches where the punctuation has more or less disappeared, but these are not so developed as the glabrous spots seen in *H. cirrata* Champ. and other species.

Fig. 3.



Hydræna princeps Fauvel.
Ædeagus, lateral view. × 100.

The ædeagus is very distinctive and not unlike that of *H. luridipennis* MacLeay*. The secondary sexual characters of the male of *H. luridipennis* are very similar to those described above for *H. princeps*, but in the latter species there is no sexual dimorphism of the elytra.

New Hebrides: Malekula, N.E., vi. 1929, 2 ♂♂, 1 ♀ specimens; Malekula, i. 1930, 1 ♀ specimen.

11. *Cœlostoma* (s. str.) *fabricii* (Montrouzier), 1860, Ann. Soc. Ent. Fr. ((3) viii. p. 245).

The emendation of the specific name of this insect to *fabriciusi* (d'Orchymont, Nova Guinea, 1924, xv. 1, p. 30) is inadmissible under Article 19 of the International Rules of Nomenclature, in that a name, once published, cannot be altered at a later date unless proof of a *lapsus calami* or printer's error is offered. Montrouzier's spelling is grammatically correct although not following modern practice.

New Hebrides: Malekula: Ounua, ii. 1929, 1 specimen.

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* *Vide* d'Orchymont, 1938, Ann. Soc. Ent. Belg. lxxvii. p. 426.

12. *Dactylosternum dytiscoides* (Fabricius), 1775, Syst. Ent. p. 67.

NEW HEBRIDES: Santo, viii.–ix. 1929, 4 specimens.

13. *Dactylosternum subquadratum* (Fairmaire), 1849, Rev. Zool. i. p. 412.

NEW HEBRIDES: Santo, viii.–ix. 1929, 3 specimens; Malekula, Ounua, iii.–iv. 1929, 1 specimen; Tanna, x. 1930, 1 specimen.

14. *Omicrogiton cheesmanæ*, sp. n.

Late ovalis, subdepressus, nitidus, rufo-brunneus, elytrorum marginibus explanatis; capite et pronoto tenuissime punctulatis, pertenuissime reticulatis, elytris decemseriatim punctatis, prosterno in medio tectiformi, obscure carinato, antice in medio proeminento; mesosterno in medio carinato, cultriformi; metasterno in medio leviter elevato, haud carinato, parte elevatâ crebre punctatâ; segmento basali abdominis haud longitudinaliter carinato.

Long. 2·865 mm. (extenso); lat. 1·64 mm.

NEW HEBRIDES: Malekula, Ounua, iii.–iv. 1929, holotype and cotype.

This species has given considerable difficulty in identification, since the series of *Omicrogiton insularis* d'Orch. in the British Museum appears to me to be a composite of two species. The types were from Engano Island (two specimens), but certain specimens identified at a later date have been labelled paratypes by d'Orchymont; these are from Ceylon (Balangoda), Sarawak (Mt. Matang), and Tonkin (Lac Tho). I have little doubt that the Ceylonese and Bornean specimens are the true *O. insularis*, but the Tonkinese specimens appear to me to be a distinct species (the Cochin China specimens mentioned by Knisch are probably conspecific with the Tonkinese specimens), characterized by their generally larger size (2·58 × 1·50 mm.), stronger and larger serial punctures on the elytra, and the presence of an incomplete reticulation on the disc of the head and pronotum. For this species I propose the name *Omicrogiton coomani*, the four specimens before me having been taken by R. P. de Cooman.

The New Hebridean species is still larger than

O. coomani, pure reddish brown with the elytral series of punctures finer and weaker, the entire head and pronotum are very finely but completely reticulated, the areoles rather transverse, and the anterior margin of the labrum is clothed with a broad band of dense golden pubescence. The mesosternal carina is more strongly developed in *O. cheesmanæ* than in either of the other two species of the genus.

15. Genus MEROSOMA, novum.

Genero Pelosoma valde affinis sed tabellâ mesosternali magis parallellâ, tenuiore; tarsis, praecipue posticis, magis robustis, tarsorum posteriorum articulo primo quam secundo tertioque simul sumptis fere aequale.

Genotype: *Pelosoma eremita* Knisch.

I consider that this species, and probably *P. sumatrense* d'Orch. and *P. orientale* d'Orch., which I have not seen, should be removed from the American genus and placed in a genus by themselves. The longer and narrower mesosternal lamella (three times longer than wide as against twice as long as wide in *Pelosoma*), the shorter and more robust tarsi, particularly the metatarsi, in which the basal segment is as long as the 2nd and 3rd taken together (the basal segment is as long as the 2nd, 3rd and 4th taken together in *Pelosoma*), and a difference in the form of the antennal pits of the prosternum, which are decidedly smaller in this new genus than in *Pelosoma*, justify a generic status equivalent to the American genus.

Merosoma eremita (Knisch), 1925, Treubia, vi. p. 204.

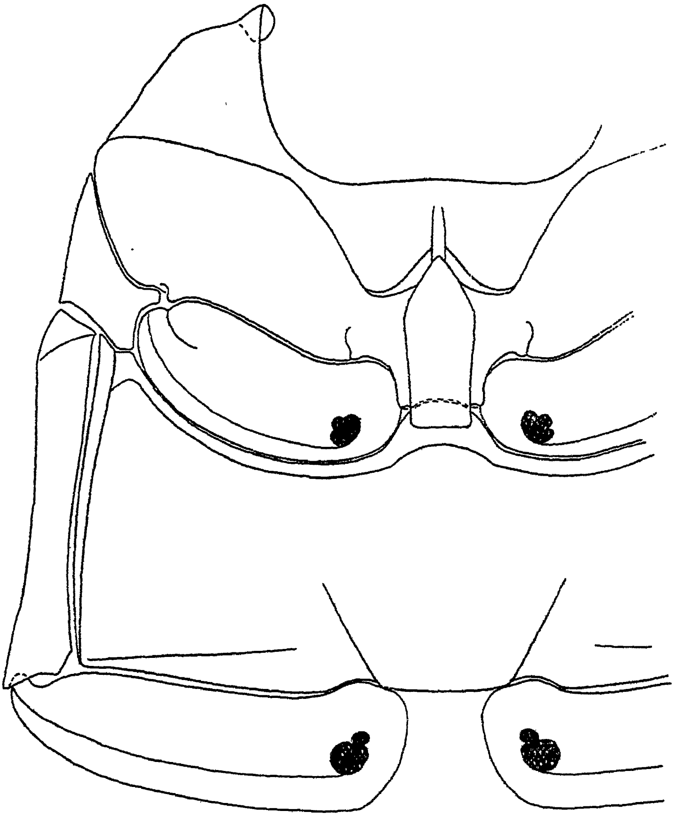
NEW HEBRIDES: Malekula; Ounua, iii.–iv. 1929, 11 specimens.

I have also received short series of this species from the Solomon Islands (Guadalcanal: Kaukau, *R. A. Lever* leg.) and New Guinea (Papua: Kokoda, *L. E. Cheesman* leg.) in addition to further specimens from New Britain.

16. *Helochares* (s. str.) *pallens* (MacLeay), 1825, Annul. Jav. ed. 1, p. 35.

NEW HEBRIDES: Malekula, N.E., vi. 1929, 3 specimens.

Fig. 4 *a*.



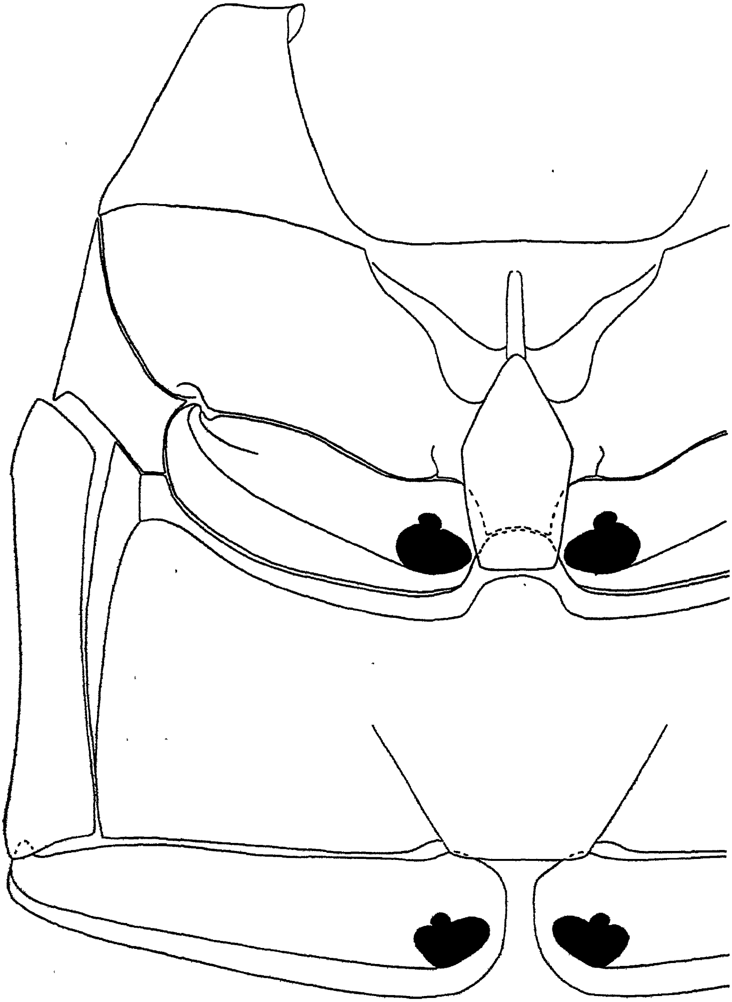
Merosoma eremita (Knisch).
Meso- and metasterna.

17. *Enochrus* (*Lumetus*) *artensis* (Fauvel), 1883, Rev. d'Ent. ii. p. 353.

New Hebrides: Malekula, Ounua, iii.–iv. 1929, 1 specimen; Malua Bay, vii. 1929, 1 specimen.

These two specimens, although larger than the size given by Fauvel, appear to belong here. They agree well with the description in all respects save that of length (4·09 × 2·23 mm.), and I should hesitate long before describing them as new on that account alone. The dark disc of the pronotum and the black sub-humeral spots of the elytra are noticeable resemblances to the European *E. coarctatus* (Gredl.) with which Fauvel compares the

Fig. 4*b*.

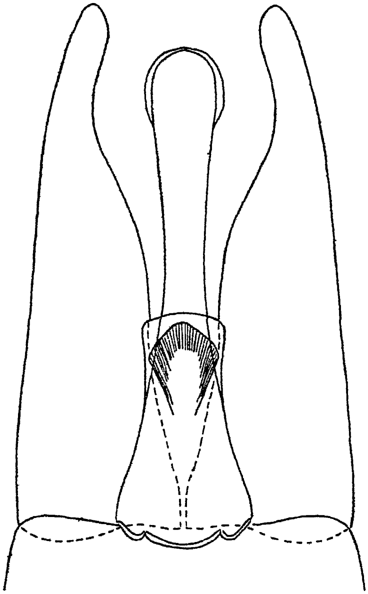


Pelosoma lafertei Mulsant.
Meso- and metasterna.

species, but the punctuation of the dorsum is decidedly finer, so that the serial punctures are conspicuous as

Fauvel mentions. The clypeus is not so heavily infuscate as in *E. coarctatus*, having only a vague anterior extension from the infuscate vertex.

Fig. 5.



Enochrus (*Lumetus*) *artensis* (Fauvel).
Ædeagus, ventral view. × 100.

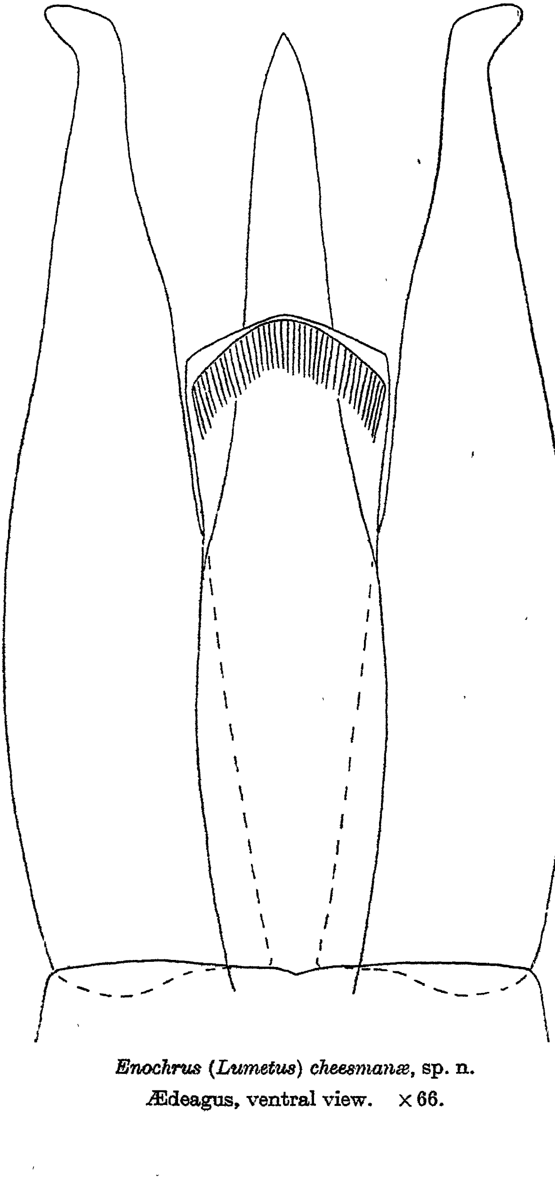
18. *Enochrus* (*Lumetus*) *cheesmanæ*, sp. n.

E. caledonico valde affinis. Oblongo-ovalis, angustulus, nitidus, fusculus ; capite, labro incluso, nigro, maculis duabus utrinque ante oculos rufo-flavis, sat dense sat fortiter punctato, palpis omnino rufo-flavis ; pronoto fusco, ad margines pallidiore, ut in capite punctato ; elytris fuscis vel fusco-testaceis, lateribus pallide fusco-flavis ; subtus niger, pedibus rufo-nigris.

Long. 4·54–5·63 mm. ; lat. 2·33–2·73 mm.

New Hebrides : Malua Bay, vi. 1929, 15 specimens ; Ounua, ii. 1929, 2 paratypes ; Ounua, iv.–v. 1929, 1 paratype ; N.E., vii. 1929, 2 paratypes. Banks Islands : Gaua, 19. xii. 1933, "Hot springs" (*J. R. Baker* leg.), 1 paratype. The holotype and allotype are from Malua

Fig. 6.



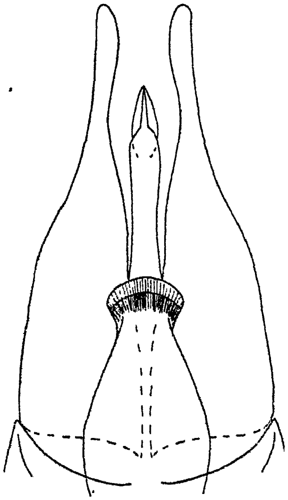
Enochrus (*Lumetus*) *cheesmanæ*, sp. n.

Ædeagus, ventral view. × 66.

Bay, the remaining specimens of that series being paratypes.

This species is quite possibly only a variety of *E. caledonicus* (Fauvel), which I have not seen, but I prefer to give it full specificity until a direct comparison can be made. It is clearly very closely related to Fauvel's species, but differs from the description in having the labrum quite black, the palpi not infuscated at the apex of the distal segment, the presence of a reddish-yellow spot on each side of the clypeus in front of the eyes, the coarse punctation of the dorsum, which is quite as coarse as in *E. bicolor* (Fabricius), with which Fauvel compares *E. caledonicus*, and the entirely black ventral surface. Considerable variation in size is shown by the series before me.

Fig. 7.



Enochrus (*Lumetus*) *esuriens* (Walker).
Ædeagus, ventral view. × 100.

19. *Enochrus* (*Lumetus*) *esuriens* (Walker), 1858, Ann. & Mag. Nat. Hist. (3) ii. p. 209.

A short series of this species, of which the identification has been verified by dissection. Although slightly larger (3·0 mm.) than the size given for *Enochrus pullus* (Fauvel) *, I am inclined to believe that the two are synonymous, since these specimens agree well with the description given by Fauvel.

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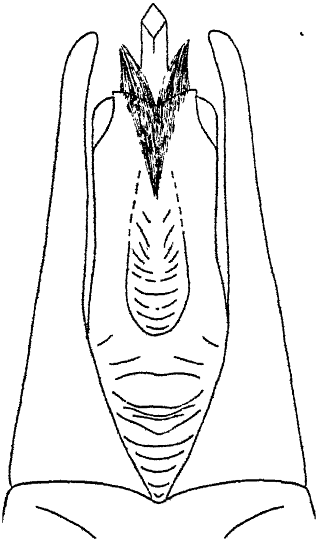
* Fauvel, 1883, Rev. d'Ent. ii. pp. 353, 354.

This species is generally placed in the subgenus *Methydrus* Rey, which was characterized as :—

"Prothorax sans séries de points plus gros, vers les côtès. Elytres sans séries de pores sétifères. Tarses posterieurs très grèles. Taille petite." *

In the species *E. coarctatus* Gredl., *E. parvulus* Kuw., and *E. esuriens* Walk., the series of larger punctures at the sides of the pronotum (also known as the "systematic series"), while not conspicuous, are clearly discernible, and the same remark applies to the serial rows of the elytra, as distinct from the general punctation. The two remaining characters are not of a degree to justify subgeneric distinction, and I think the subgenus must be suppressed and the species included in the subgenus *Lumetus*.

Fig. 8.



Neohydrophilus marginicollis (Hope).
Ædeagus, ventral view. × 50.

New Hebrides: Malekula, Ounua, iv.–v. 1929, 1 specimen; N.E., vi. 1929, 4 specimens. Banks Islands: Gaua, 20. xii. 1933, "Hot springs," 2 specimens (*J. R. Baker* leg.).

20. *Sternolophus* (*Neosternolophus*) *marginicollis* (Hope), 1841, Proc. Ent. Soc. Lond. iv. p. 48.

I have compared the series with New Caledonian specimens of *S. artensis* Fauvel, one of which is authentic, and also with specimens from Queensland and Arnhemland identified by d'Orchymont as *S. marginicollis* (Hope), and have no hesitation in identifying the series before me as the latter species. I am inclined to suppose that the Fijian record for *S. artensis* given by Fauvel is probably a misidentification for *S. marginicollis*, although I have seen no Fijian specimens. Its presence in the New Hebrides, which lie between New Caledonia and the Fijian group, makes this supposition more probable.

NEW HEBRIDES: Malekula; Ounua, ii.–iii.–iv. 1929, 11 specimens; Malua Bay, vi. 1929, 5 specimens; N.E., vii. 1929, 2 specimens; Malekula, iii. 1930, 6 specimens; Erromanga, viii. 1930, 1 specimen.

21. *Hydrophilus* (s. str.) *australis* Montrouzier, 1860, Ann. Soc. Ent. Fr. ((3) viii. p. 248).

This species has hitherto been supposed to be endemic to New Caledonia. In addition to the specimens from Miss Cheesman's collection, there is a single male in the British Museum, from the old Fry Collection, labelled "Brazier, New Heb."

NEW HEBRIDES: Malekula, N.E., vii. 1929, 2 ♂♂, 1 ♀ specimens.

BIBLIOGRAPHICAL NOTICES.

(1) *Text-book of General Zoology.* By W. C. CURTIS and MARY J. GUTHRIE. Third Edition. Pp. xvii+682, text-illust. (New York: J. Wiley & Sons, Inc. London: Chapman & Hall, 1938.) Price 18*s*. 6*d*. net.

(2) *An Introduction to the Vertebrates.* By L. A. ADAMS. Second Edition. Pp. vii+479, text-illust. (New York: J. Wiley & Sons, Inc. London: Chapman & Hall, 1938.) Price 17*s*. 6*d*. net.

THE fact that these two text-books have reached a second and a third edition respectively is evidence that they have been found adapted to the needs of American teachers and students of Zoology. Each has certain qualities that may render it of use in this country also.

(1) The vast diversity of subjects now included under the term Zoology makes it a task of supreme difficulty to compress a survey of the whole field into an elementary text-book. It can be said, however, that the student will find in this volume an introduction to the subject that is, on the whole, well-balanced and judicious, and if some subjects seem to be made unduly prominent while others are too lightly touched on, the same might be said of every text-book that has been, or perhaps ever will be, written.

It begins with a series of chapters on the structure and physiology of Vertebrates, taking the frog as a starting point, and proceeds to deal in a more general way with reproduction, development, heredity, and variation. This is followed by a survey of the chief phyla of the Animal Kingdom (the study of special types is wisely relegated to the practical class), and the book closes with a chapter on "The History of Organisms," in which the evidence for evolution is set forth and the main theories as to its method are impartially explained. The authors state in the preface that they have attempted "to write clearly, but not with undue simplification of vocabulary or expression," on the very sound principle that "it is better for a student to find places in a text-book a bit difficult than to find it all easy." The illustrations are numerous and for the most part excellent, although one or two have suffered severely in the printing.

(2) There is at present a distinct need for a good introductory text-book on Vertebrate morphology. Adams' 'Introduction to the Vertebrates' does not adequately fill the gap, but at least it provides the student with much information that he will not find so conveniently elsewhere. After a section on the classification of Vertebrates (somewhat perfunctory, as it seems to a systematist) a series of chapters deal in turn with the various systems of organs. A third section follows in which the Classes of Vertebrates are taken in order and their anatomy is described, based, for the most part, on a single type for each. This arrangement involves a good deal of repetition and in places the style might with advantage be more concise. It is far from correct to say that the liver of Cyclostomes "is represented only by follicles on the surface" of the digestive tube. There are some misspellings of generic names that may confuse the student and slips in the Latin terminology.

LIX.—*Notes sur quelques* Scydmænidæ.

Par JEAN LHOSTE.

LES Scydmænidæ qui font l'objet de cette étude m'ont été communiqués aimablement par Sir G. A. K. Marshall, Directeur de l'Imperial Institute of Entomology.

Dans ce lot qui ne forme pas une unité géographique mais où des individus sont originaires d'Afrique, de l'Inde, de la Malaisie et de Nouvelle Zelande, j'ai reconnu une dizaine d'espèces qui se répartissent comme il suit :

En premier lieu nous avons deux espèces du genre *Clidicus* Cast. Ce sont les *C. mysorensis*, sp. n., et *C. termitophilus*, sp. n. Ces deux espèces ont chacune un interêt bien particulier. La répartition géographique * connue des *Clidicus* était la suivante : quatre espèces des îles Java, Sumatra et Bornéo, une du Tonkin (Hoa-Binh), une autre de Ceylan. Une espèce que je présente ici, le *C. mysorensis* originarie de l'État de Mysore, apporte donc un premier fait nouveau. La pénétration du genre *Clidicus* dans le continent asiatique est plus poussé qu'il ne paraissait jusqu'alors. Le Mysore sera la localité la plus occidentale connue et la plus éloignée du centre de dispersion supposé, le bloc démembré Bornéo-Java-Sumatra.

Un deuxième fait notable est apporté par le *C. termitophilus*. Cette espèce originaire de l'État de Sarawak, c'est à dire du centre de dispersion du genre, est nommée ainsi en raison de sa cohabitation avec des termites. Je crois intéressant de signaler ce fait car les autres espèces du genre *Clidicus* sur lesquelles nous avons des renseignements biologiques précis—*C. grandis* Cast. et *C. tonkinensis* Lhoste—ont été trouvés en compagnie de fourmis. La vie de ce genre si curieux et si archaique est donc liée à celle des insectes sociaux, fourmis ou termites, qui lui procurent la protection de leur cité et probablement la nourriture.

Ensuite nous avons cinq espèces du genre *Scydmænus* Latr. qui se répartissent en *Scydmænus* (s. str.) et *Eustemmus* Reitt.

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* Bull. Soc. Ent. France, 1938, p. 282.

Deux espèces du genre *Euconnus* Thoms. dont l'une, le *E. bryanti*, appellera peut être ultérieurement la création d'un nouveau genre.

Enfin, je mentionnerai, la présence d'un *Phagonophana latuliceps* Broun, porteur des renseignements biologiques suivantes : G. V. Hudson a trouvé cette espèce parmi des feuilles morte en Nouvelle Zélande, à Wellington, Lowans Valley, en Avril 1923.

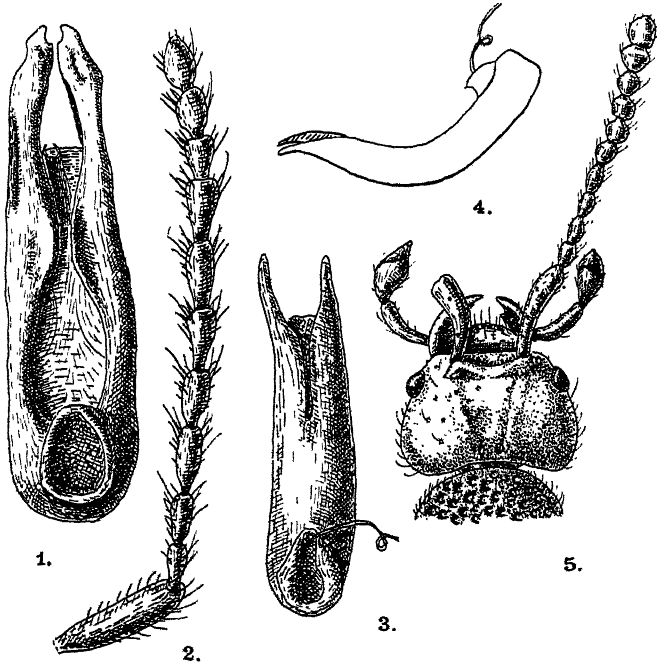

Fig. 1.—*Clidicus mysorensis*, sp. n. Organe copulateur mâle.
Fig. 2.—Antenne de la meme espèce.
Fig. 3.—*Clidicus termitophilus*, sp. n. Organe copulateur vu de face.
Fig. 4.—Profil.
Fig. 5.—Tête.

Clidicus mysorensis, sp. n.

Type au British Museum.

India : Mysore, Bababuddin Hills, Juin 1915 (*T. V. Ramakrishna Ayyar*).

Long. 6·5–7 mm. Brun rouge clair ; ponctuation nulle sur la tête et le pronotum, les élytres ponctués et striés avec modération : l'intervalle entre deux points étant égal à un diamètre et celui entre deux rangées en moyenne à trois diamètres. Pubescence longue et touffue sur la tête et sur l'apex des élytres, dense sur les pattes, plus clairesemée sur le pronotum.

Tête transverse, sillon longitudinal profond, joues ervenant un peu en arrière; yeux petits ; antennes (fig. 2) longues, composées d'articles aplatis, les 9, 10, 11 plus courts que les précédents, le 8 par exemple, deux fois plus long que large. Pronotum peu convexe, aussi long que large, bords latéraux droits, convergents vers l'arrière, maximum de largeur en avant. Élytres fortement accuminés à l'apex plus de trois fois aussi longs que larges ; calus huméral effacé. Dessous normal, métasternum très réduit. Pattes longues mais robustes.

Organe mâle (fig. 1) montrant le grand développement des paramères légèrement asymétriques, la pointe péniale étant réduite à une petite pièce peu chitinisée.

Le *Clidicus mysorensis* semble très proche du *C. grandis* Cast., mais la structure des antennes est toute différente, presque filiforme chez le premier, elle est moniliforme chez le second.

Par sa localité axée à l'Ouest, le *C. mysorensis* est particulièrement remarquable comme nous l'avons déjà mentionné.

Clidicus termitophilus, sp. n.

Type au British Museum.

Borneo : W. Sarawak, Mont Métang, 1. ii. 1914 (*G. E. Bryant*).

Long. 4 mm. Brun rouge foncé, luisant ; ponctuation céphalique éparse, relativement faible, celle du pronotum très grosse (fig. 5) les intervalles étant plus étroit que le diamètre des points ; élytres à ponctuation geminée aussi grosse que celle du pronotum mais beaucoup plus irrégulière. Tête à peu près glabre, pilosité assez longue mais éparse sur le reste du corps.

Tête transverse (fig. 5) plus large que le pronotum et non divisée en deux par un sillon, on distingue au contraire deux faibles carènes s'établissant en V à partir de la base de la tête pour aboutir aux calus surantennaires ; yeux petits, globuleux ; antennes relativement courts : article 1 très long, les suivants courts s'élargissant progressivement pour être transverses au 6, les cinq derniers articles formant une massue allongée. Pronotum assez globuleux à bords latéraux droits dans leur seconde moitié, arrondis en avant, base creusée d'un chapelet de petites fovéoles guère plus grandes que la ponctuation. Élytres normaux, accuminés à l'apex. Pattes robustes, fémurs légèrement pliés vers le genou.

Organe copulateur (figs. 3 et 4) tout à fait différent de celui des trois autres connus. Ici les paramères sont soudés sur la moitié de leur longueur et ont perdus leurs sculptures particulières pour ressembler étrangement à l'organe d'un *Mastigus* de la lignée *grandis*, à *M. prolongatus* Gory par exemple. A retenir seulement que chez les *Mastigus*, c'est le paramère droit (d'après le position morphologique de l'organe) qui est en régression et que chez les *Clidicus* l'inégalité se fait par la réduction du paramère gauche.

Le *C. termitophilus* est très voisin du *C. tonkinensis* Lhoste, mais en diffère par le ponctuation prothoracique, nulle sur celui-ci, très forte chez celui-là, et du *C. laticeps* Pic. De cette dernière espèce il s'en sépare notamment par la structure de la tête " fortement entaillée au milieu avec les tempes un peu avancées postérieurement " (d'après M. Pic).

Au point de vue biologique une particuliarité notable ; le *C. termitophilus* fut trouvé en compagnie de termites, dont l'Imperial Institute possède un soldat. Donc le genre *Clidicus* possède à la fois des espèces myrmécophiles et termitophiles.

Scydmænus antennatus Lhoste.

Kenya Colony : Nairobi, 5450 pieds, 9. v. 1921 (*A. F. J. Gedye*). Sudan : Karamota, 29. xii. 1933 (*Miss M. Steele*), " from sweeping bushes " or " from under dead leaves in forest."

Cette espèce reste très isolée dans le sous-genre *Scydmænus* s. str.

Scydmænus pilosipensis Lhoste.

Uganda : Kigezi, 5500 pieds, xi. 1928 (*Dr. G. D. H. Carpenter*).

Cette espèce fait partie de la lignée du *S. antennalis* Lhoste * ainsi que l'espèce suivante.

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* *Cf.* 'Résultats scientifiques de la Mission de l'Omo, 1932–33.' Scydmænidæ africains.

Scydmænus steelæ, sp. n.

Type au British Museum.

ANGLO-EGYPTIAN SUDAN : Ikotos, 24. xii. 33 (*Miss M. Steele*).

Long. un peu plus de 1·5 mm. Brun rouge clair avec les élytres en général un peu plus foncé. Ponctuation irrégulière ; pubescence très fine sur la tête, transversale, un peu plus dense sur le pronotum, serrée sur les élytres et plus grosse que partout ailleurs.

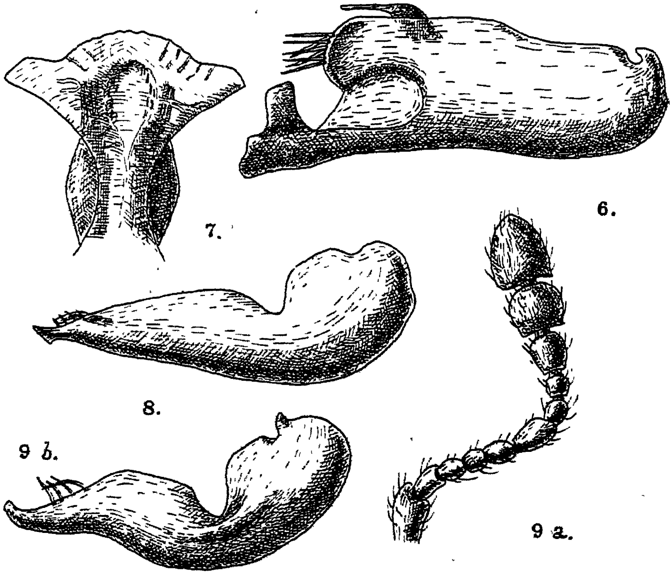


Fig. 6.—*Scydmænus* (s. str.) *steelæ*, sp. n. Organe copulateur mâle (profil).
Fig. 7.—Pointe péniale vue de face.
Fig. 8.—*Scydmænus* (s. str.) *kigeziensis*, sp. n. Organe mâle (profil).
Fig. 9.—*Scydmænus* (*Eustemmus*) *salomonensis*, sp. n. *a*, antenne droite ; *b*, organe copulateur mâle (profil).

Tête transverse, normale, un plus longue que la moitié du thorax ; antennes à massue de trois articles sans aucune particularité : article 2 double du 1, les 3–6 une fois et demie plus longs que larges et subégaux entre eux, les 7 et 8 réduits, le 11 obconique moins long que les deux précédents réunis. Pronotum presque aussi long que large, faiblement convexe ; bords latéraux régulièrement arrondis ; fovéoles basales petites oblongues, bien délimitées, calus huméral, bourrelet scutellaire et fovéole basale peu visibles. Elytres amples un peu plus de deux fois plus longs que larges avec le maximum de largeur un peu après le milieu. Dessous et pattes normaux.

Organe mâle droit (fig. 6) soies rigides ; pointe péniale (fig. 7) très large, dilatée latéralement.

Cette espèce du genre *Scydmænus* s. str. est tout à fait caractéristique par ce que l'on peut appeler ses caractères négatifs. Rien extérieurement si ce n'est de très petits détails à peine perceptibles ne la différencie de la masse de ses congénères. L'organe mâle permet de la placer dans la lignée du *S. antennalis* Lht., décrit et figurée dans les 'Résultats Scientifiques de la Mission de l'Omo,' avec quelques autres espèces de la même souche.

Cette espèce est signalée comme ayant été trouvée par Miss M. Steele, à qui je la dédie, " en forêt, sous les feuilles mortes " et " sur les berges d'une rivière."

Scydmænus kigeziensis, sp. n.

Type au British Museum.

UGANDA : Kigezi, 5500 ft., novembre 1928 (*G. D. H. Carpenter*) ; Kampala, 3700 ft. (*A. F. J. Gedye*).

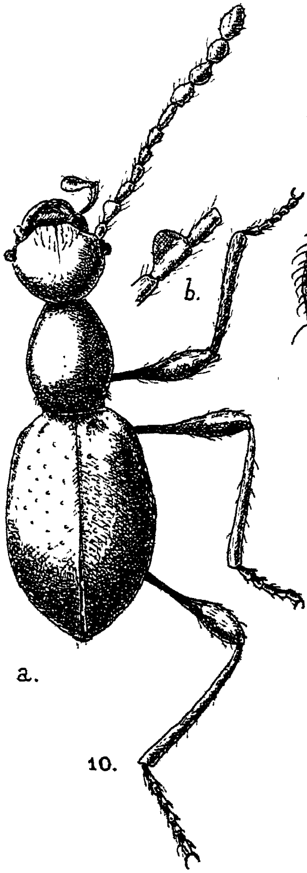
Long. un peu moins de 1·5 mm. Brun rouge avec les appendices plus claires ; ponctuation nulle, pubescence assez éparse, longue surtout sur les élytres.

Tête transverse, un peu plus de la moitié de la longueur du pronotum ; antennes assez longues de structure normales : articles 7 et 8 transverses, les 9 et 10 arrondis mais sensiblement aussi longs que larges, le 11 subconique nettement moins long que les deux précédents réunis. Pronotum luisant un peu plus long que large, bords arrondis avec le maximum de largeur vers le milieu, le deux fovéoles prothoraciques médianes plus grandes que les deux latérales et très rapprochées, déterminant un pincement dans la chitine. Élytres un peu plus de deux fois aussi longs que larges, normaux. Pattes et dessous sans caractère spécifique.

Organe copulateur à peine coudé dans les deux premiers tiers (fig. 8) ; pointe péniale tronquée avec quelques petits soies presque invisibles.

Donc peu de caractères externes intéressants. L'organe copulateur permet de lier cette espèce au *S. elongatus*

Lhoste. Les *S. kigeziensis* et *S. elongatus* forment une ramification, une sous-lignée de le lignée *tarsatus* Muller et Kunze.



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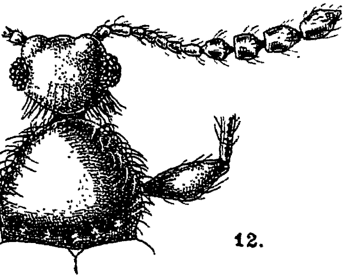

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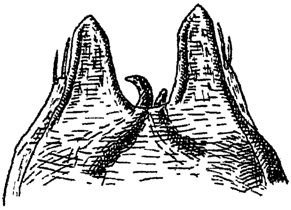

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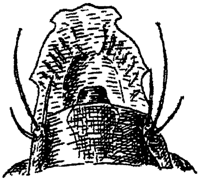

11.

Fig. 10.—*a, Euconnus bryanti*, sp. n.; *b*, detail de l'antenne droite.
Fig. 11.—Pointe péniale.
Fig. 12.—*Euconnus* (s. str.) *leonensis*, sp. n. Tete et pronotum.
Fig. 13.—Pointe péniale.

Scydmænus (*Eustemmus*) *salomonensis*, sp. n.

Type unique au British Museum.

Solomon Islands, 1934 (*H. T. Pagden*).

Long. 1 mm. Brun clair; pubescence légère; imponctué.

Tête oblongue nettement plus longue que la moitié du pronotum, et aussi large. Antennes (fig. 9, *a*) courtes et robustes : article 1 double du 2, les 3-4-5 subégaux, le 6 plus gros que la normale, deus fois plus long que le 7, les 7 et 8 transverses, normaux, le 9 un tiers moins volumineux que le 10, le 11 obconique moins long que les 9 et 10 réunis. Pronotum d'un tiers environ plus long que large avec le maximum de largeur vers le tiers antérieur qui est arrondi, les deux autres tiers postérieurs sont droits et convergents vers la base. Pas de fovéoles basales. Ailé. Élytres avec un calus huméral très peu apparent, pas de bourrelet scutellaire. Pattes et dessous normaux.

Organe copulateur coudé en angle droit (fig. 9, *b*) et très semblable à ceux de la lignée du *Scydmænus* (s. str.) *duricollis*.

Il est intéressant de rapprocher cette espèce des îles Salomon de l'espèce décrite de Vanikoro et nommée *Scydmænus* (s. str.) *vanikoro* Lhoste. Ce *Scydmænus*, et je l'ai signalé *, extérieurement possède tous les caractères des *Scydmænus* (s. str.) mais son organe copulateur mâle est celui d'un *Cholerus*. Dans le cas présent, nous avons un *Scydmænus* faisant partie du sous-genre *Eustemmus* par l'absence de ses fovéoles prothoraciques, avec son organe copulateur typiquement de *Scydmænus* (s. str.) ; de plus cet exemplaire est originaire des îles Salomon, c'est à dire d'un localité bien voisine de l'île Vanikoro. A propos du *S. vanikoro*, je posais cette question " est-ce l'indice permettant de supposer que les *Scydmænus* sont originaires d'Indo-Malaisie ? " Avec le *S.* (*E.*) *salomonensis* l'on doit se reposer le même problème, car il apparaît que c'est dans cette région que les sous-genres semblent le plus mêlés.

Euconnus bryanti, sp. n.

Type au British Museum.

CEYLAN : Kandy, 1. vi. 1908 (*G. E. Bryant*).

Long. 2·5 mm. Brun clair, luisant ; ponctuation imperceptible sur la tête et le pronotum, très superficielle mais assez grosse sur les élytres ; pubescence assez longue sur le devant de la tête, excessivement courte sur l'apex des élytres (fig. 10, *a*).

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* 'Revue française d'Entomologie,' 1938, p. 97.

Tête arrondie, parcourue par un sillon brunâtre longitudinalement ; yeux réduits mais saillants. Antennes longues, inserrées sous une carêne frontale, massue grêle de quatre articles : article 1 normal, le 2 dilaté intérieurement (fig. 10, *b*), les 3–6 subégaux près de deux fois aussi longs que larges, le 7 prolongé en avant, d'un tiers plus long que le précédent mais aussi large, les 8–10 deux fois plus larges que le 7 et à peu près de même longueur, le 11 presque du double du 10, subconique. Pronotum un peu plus long que large, plus étroit en avant qu'en arrière ; pas de trace de fovéole, mais leur place est indiquée par quelques soies courtes, très rigides. Élytres trois fois plus longs que larges, environ, à calus huméral bien saillant, leur maximum d'amplitude est vers le milieu. Dessous normal. Pattes très longues, grêles, fémurs renflés en massue.

Organe copulateur oblong, peu coudé ; pointe péniale (fig. 11) homogène, dentée ; paramères portant trois soies dont l'une est le double des deux autres.

J'ai mis sous ce nom provisoire de *Euconnus bryanti* cette espèce tout à fait particulière car le manque de matériel m'interdit de créer un genre nouveau sur cet exemplaire unique. On aurait tendance à rapprocher de cette espèce l'*Euconnus liberiæ* et ses proches parents, mais plusieurs caractères s'y opposent : les têtes sont de structures différentes, les yeux réduits ici et saillants, sont encore grands et non saillants, chez *E. liberiæ* Lhoste, par exemple ; les organes mâles sont de conformation dissemblable.

Je dédis cette espèce à son récolteur avec grand plaisir.

Euconnus (s. str.) *leonensis*, sp. n.

Type au British Museum.

Sierra Leone : Njala, 15. xi.–8. xii. 1930, 8–14. v. 1932 (*E. Hargreaves*), pris à la lumière.

Long. un peu plus de 1·5 mm. Brun avec les appendices un peu plus clairs ; pubescence abondante, souple en général avec des soies rudes sur les joues et les bords latéraux du pronotum, soies élytrales courtes très régulièrement disposées.

Tête (fig. 12) oblongue, plus large que longue ; yeux très volumineux occupant plus de la moitié du bord latéral, et composés d'omatidies globuleuses. Antennes

avec une massue de quatre articles, de structure normale : l'article 2 est le peu plus long des sept premiers, les articles 7–11 sont d'un volume identique. Le pronotum (fig. 12) est très large, peu convexe à bords arrondis et le maximum de largeur étant atteint dans le tiers postérieur de sa longueur ; cinq fovéoles bien individualisées ornent la base du pronotum. Élytres amples, à peine deux fois et demie aussi longs que larges, avec le maximum de largeur vers le milieu ; deux fovéoles sur chaque élytre sont à leur bases ainsi qu'un calus huméral saillant. Dessous normal. Pattes robustes, tibias légèrement explanés vers leur tiers postérieur, puis rétrécis à la base.

Organe copulateur coudé, bilobé (fig. 13) avec une ou deux soies aux paramères.

L'identité de cette espèce est très facile à établir. La structure des yeux, des fovéoles prothoraciques et élytrales, de l'organe copulateur mâle font autant de caractères typiques du genre *Euconnus* (s. str.). Cette espèce sera à rapprocher dans une révision future des *E. congoensis* et *E. micrus* originaires du Congo Français, c'est à dire, non loin de Sierra Leone.

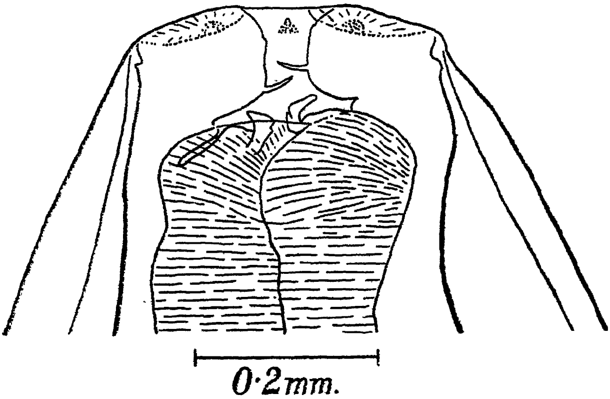
LX.—*A new Species of* Oxyuris *[Nematoda] from a Rhinoceros.* By H. A. BAYLIS, M.A., D.Sc., Department of Zoology, British Museum (Natural History).

THE species to be described in this paper was obtained from an African rhinoceros (*Rhinoceros bicornis*) in the Karamoja district of Uganda, and specimens of it were kindly forwarded to the writer by the Senior Veterinary Research Officer at Entebbe. The type-specimens will be deposited in the British Museum (Natural History).

Oxyuris karamoja, sp. n.

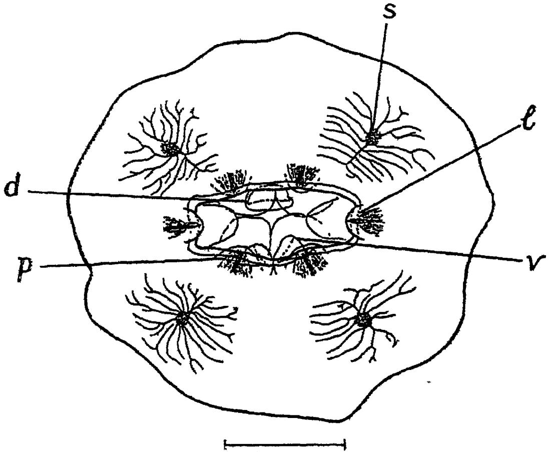
The material included one male and seventeen females, of various sizes and degrees of maturity. The length of the male is about 14 mm. and its maximum thickness 0·8 mm. The largest female measures 68 mm. in length and about 2·6 mm. in maximum thickness. In the smallest female the uterus contains no fully-formed eggs,

Fig. 1.



Oxyuris karamoja, sp. n. Anterior extremity of female, viewed from left side.

Fig. 2.



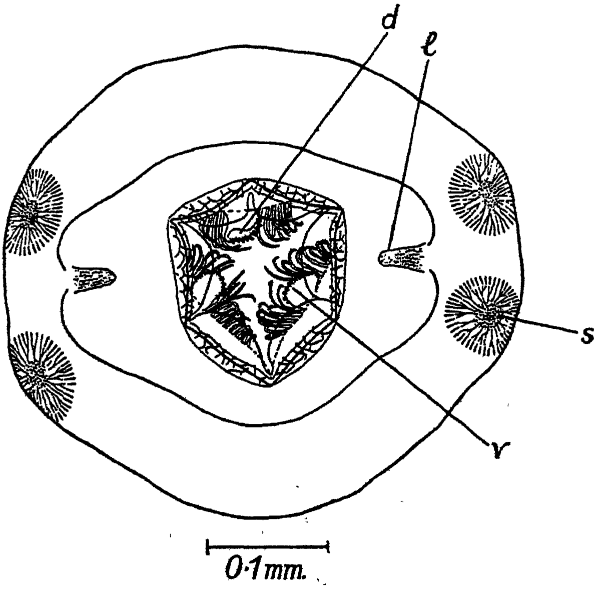
Oxyuris karamoja, sp. n. Anterior extremity of female, viewed *en face*.
d, dorsal tooth; *l*, lateral papilla; *p*, internal papilla; *s*, subdorsal papilla; *v*, subventral tooth.

but fertilization had taken place, as shown by the presence of a mass of cement over the vulva. This specimen measures 25 mm. in length and 1·13 mm. in thickness. The smallest female with fully-formed eggs is just over 30 mm. long and about 1·5 mm. thick.

The cuticle shows coarse transverse striations throughout, the intervals between them, at about the middle of the body, reaching about 0·055 mm. in the male and from 0·09 to 0·24 mm. in the females, according to their size. The cuticle near the anterior end is slightly inflated, or, rather, the subcuticular layer is separated from it by a space. The characters of the anterior extremity (figs. 1 and 2) differ somewhat from those of *O. equi* (fig. 3). The aperture of the mouth, instead of being hexagonal, is almost oblong, with its longer axis laterolateral. The lateral papillæ (fig. 2, *l*) are similar to those of *O. equi* (fig. 3, *l*), but their terminations are situated on the lateral borders of the mouth instead of some distance away from it. The four submedian papillæ (fig. 2, *s*) are somewhat similar in structure to those of *O. equi* (fig. 3, *s*) and have similar branching intracuticular processes radiating from a central point, but they lack the regular peripheral circles of rod-like rays. In addition to these organs there are four internal papillæ (fig. 2, *p*), two subdorsal and two subventral, with terminations projecting on the lining of the buccal cavity, at a deeper level than the lateral papillæ. The existence of these internal papillæ in *O. equi* does not appear to have been described, nor has the writer been able to observe them in that species.

The cuticle lining the mouth-aperture appears to be smooth. This is a further point of difference from *O. equi* (fig. 3), in which the cuticle bordering the mouth shows a delicate network of raised ridges. This structure seems to have been observed by Flögel (1869), who describes it as a "zellenartige Zeichnung," but is more accurately described by Martini (1916). Within the aperture there are, as in *O. equi*, six delicate, more or less semicircular cuticular plates (two lateral, two subdorsal, and two subventral) projecting inwards from the lining of the buccal cavity. The latter has a depth of about 0·05 mm. in the male and 0·1–0·15 mm. in the female. In the female only there are three hook-like teeth projecting into it from its floor, which is formed by the cuticular covering of the anterior end of the œsophagus. These teeth are broad and flattened when seen in frontal view (fig. 2, *d*, *v*), and curve outwards at their free extremities (fig. 1). Unlike the teeth of *O. equi* (fig. 3, *d*, *v*) they appear to be quite smooth and without denticulations. The cuticular bristles which, in the female of *O. equi*, originate at the same level as the teeth, and project into the buccal cavity, are here absent.

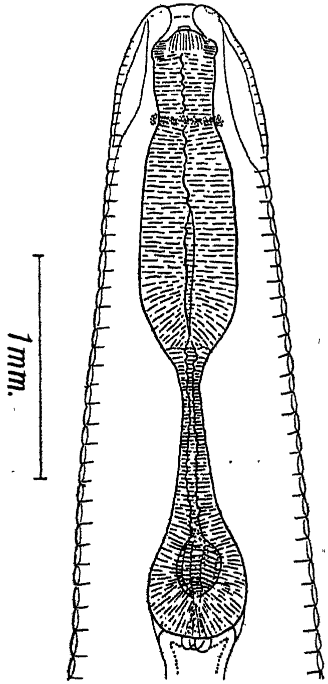
Fig. 3.



Oxyuris equi. Anterior extremity of female, viewed *en face.* *d*, dorsal tooth; *l*, lateral papilla; *s*, subventral papilla; *v*, subventral tooth.

The œsophagus (fig. 4) is of a very characteristic shape. Its total length, measured from the anterior extremity, is 1·75 mm. in the male and about 2·5–3 mm. in the female. Its anterior portion is somewhat flask-shaped, being narrow near the mouth and expanding rather suddenly just behind the nerve-ring. This is in strong contrast to the shape of this portion of the œsophagus in *O. equi*, the widest portion of which is near its anterior end. This anterior portion, in *O. karamoja*, measures 0·85 mm. in length in the male and 1·3–1·55 mm. in the female, and attains a maximum width of 0·32 and 0·43–0·54 mm. respectively. It is followed by a bulb with an elongate, narrow neck. The length of the whole bulb is about the same as that of the anterior portion (0·85 mm. in the male and 1·2–1·5 mm. in the female). In the male the maximum diameter of the bulb is 0·33 mm., in the female 0·44–0·6 mm. The bulb contains a valvular apparatus with a relatively thick, transversely corrugated cuticular lining. The nerve-ring surrounds the anterior portion of the œsophagus at a distance of about 0·3 mm.

Fig. 4.

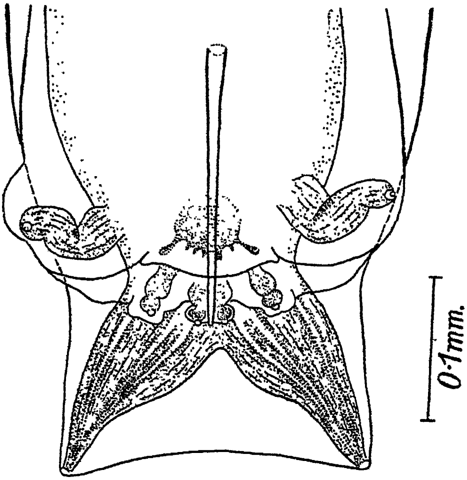


Oxyuris karamoja, sp. n. Anterior end of female; dorsal view.

in the male, and about 0·5 mm. in the female, from the anterior extremity. The excretory pore is situated far behind the œsophageal bulb, at a distance of 4·5 mm. in the male, or 7–8·5 mm. in the female, from the anterior end. In the female it is about 1·5–3·5 mm. in front of the vulva.

The form of the caudal end in the male (fig. 5) is similar to that of *O. equi*. The papillæ have the same arrangement, there being one pair of preanal papillæ with long, stout peduncles, and three pairs of postanal papillæ.

Fig. 5.

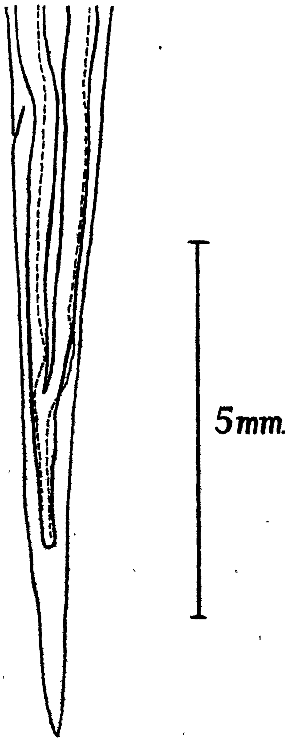


Oxyuris karamoja, sp. n. Posterior end of male; ventral view.

Of these the most posterior pair are very large, with stout, conical peduncles supporting a rectangular cuticular expansion. The two smaller pairs are close to the cloacal aperture, the inner pair on a process which is grooved ventrally and forms a support for the spicule when the latter is protruded. Ehlers (1899) describes and figures a median preanal papilla in *O. equi*. The writer has been unable to confirm the existence of this papilla in either species, or of the two other papilla-like structures figured in front of it by Ehlers, but not mentioned in his text. The anterior lip of the cloacal aperture contains a parenchymatous structure with a fringe of rays or processes on its posterior border. The spicule, in the single specimen available, measures about 0·21 mm. in length. Its extreme tip is possibly missing.

The tail of the female (fig. 6) shows a similar variation in length to that of *O. equi*. This variation, as in that species, is evidently correlated with the age and maturity of the specimen, the tail becoming longer as more space is occupied by the developing uterus. In the smallest female, without eggs, the anus is situated at 2·4 mm. from the posterior extremity. In other specimens the tail varies from 6 to 22 mm. in length. There is no constriction marking it off from the body, the latter beginning to taper gradually some distance in front of the anus.

Fig. 6.



Oxyuris karamoja, sp. n. Posterior end of female ; lateral view.

The female genital organs are similar to those of *O. equi*. The vulva is situated at 7·5 mm. from the anterior end in the immature female, and at 9–12 mm. in older specimens. The muscular vagina runs forward at first from the vulva, then doubles back and passes into the long, straight egg-reservoir. This extends to just behind the anus in the immature worm, and to within 2–3 mm. of the tip of the tail in older females, maintaining this relationship as the tail elongates. The growth of the tail thus appears to take place between this point and the anus. The arrangement of the uterine branches and ovarian tubes is the same as in *O. equi*. The eggs are also similar, the shell having an operculum at one end. They measure 0·086–0·094 mm.×0·038–0·04 mm. The shell is sometimes regularly oval, sometimes more pointed at one end than at the other. In the latter case the operculum is at the broader end.

As has been shown in the foregoing description, this species differs in several respects from *Oxyuris equi* (syn. *O. curvula*), the common form occurring in Equidæ, though it bears a very close superficial resemblance to it. Mönnig (1927, p. 224) has recorded the occurrence of *O. equi* in *Rhinoceros bicornis* in Zululand, but gives no description of the specimens. It seems possible that these may actually have been examples of the species here described as *O. karamoja*. The other species at present assigned to *Oxyuris* (sens. strict.) are *O. tenuicauda* v. Linstow, 1901, from a zebra (*Equus crawshayi*) in East Africa, and *O. poculum* v. Linstow, 1904, from ponies in Ceylon. It appears uncertain whether either of these is really distinct from *O. equi*. In *O. poculum*, however, the spicule of the male is said to be 0·44 mm. long, and thus much longer than is usually recorded for *O. equi*. The male of *O. tenuicauda* is unknown, and the female is very inadequately described. *Oxyuris triradiata* Hall, 1916, which was doubtfully referred to *Oxyuris* (s. s.) by Yorke and Maplestone (1926), has been shown by Manter (1930) to belong to the genus *Citellina* Prendel, 1928.

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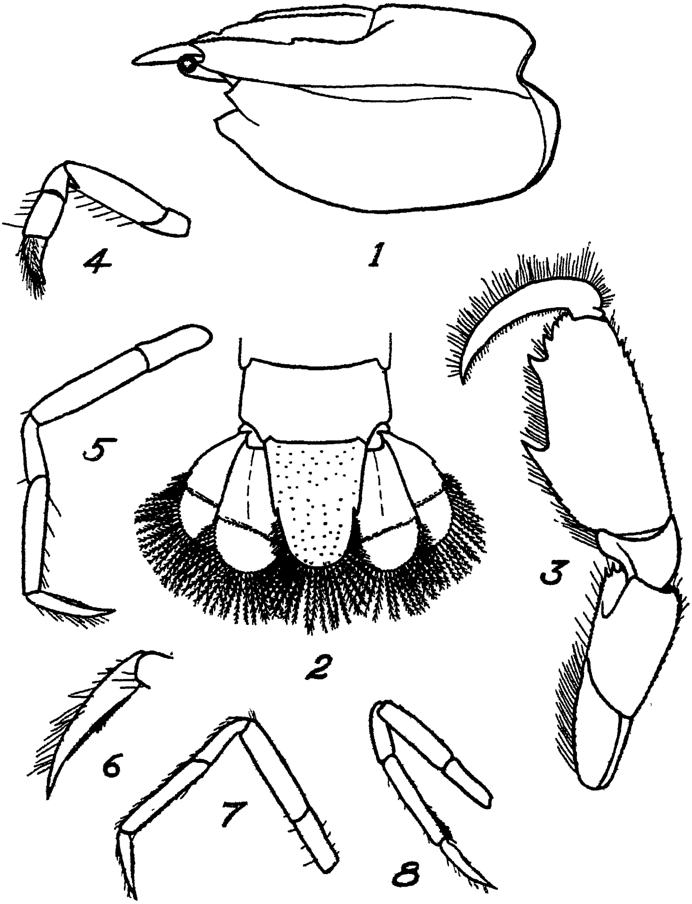
LXI.—*On the Systematic Status of the Crustacean Genera* Naushonia, Homoriscus, *and* Coralliocrangon. By FENNER A. CHACE, Jr., Museum of Comparative Zoölogy, Cambridge, Mass.

DR. ROBERT GURNEY has recently called my attention to the fact that the branchial structure of the genus *Homoriscus* Rathbun does not justify the inclusion of this form in the family Cragonidæ, where it has recently been placed. Examination of a perfect female specimen of *Homoriscus portoricensis* Rathbun collected last year among rocks along the shore at Havana, Cuba, by Dr. Luis Howell Rivero of the University of Havana bears out this contention. This study has also indicated that both *Homoriscus* and *Coralliocrangon* Nobili from the Red Sea should be synonymized with *Naushonia* Kingsley from the southern coast of Massachusetts, and that this genus is best accommodated by the erection for it of a new subfamily, the Naushoniinæ, in the family Laomediidæ of the Thalassinidea.

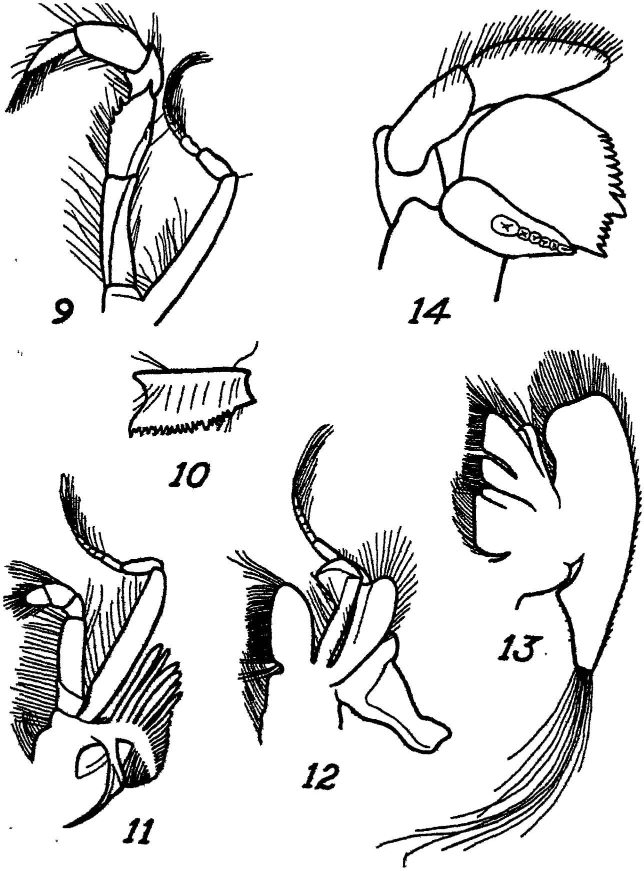
Naushonia was established by Kingsley (1897) for a shrimp found by Professor Hermon C. Bumpus of Brown University on the Island of Naushon, one of the Elizabeth Islands, off the southern coast of Massachusetts. Kingsley called this form *Naushonia crangonoides* and noted a superficial similarity between it and the members of the Cragonidæ, but at the same time he called attention to certain differences which might subsequently warrant the erection of a new family for it. Gray (1901) published a brief note on a second specimen of the same species collected by himself at Ram Island in the harbour at Woods Hole, Massachusetts. Thompson (1903) redescribed these two specimens with good figures and also described several of the larval stages taken in the plankton



Naushonia portoricensis (Rathbun), female.

Fig. 1.—Lateral view of carapace, × 9·5.
Fig. 2.—Telson and uropods, × 10.
Fig. 3.—First pereiopod, × 9·5.
Fig. 4.—Second pereiopod, × 9·5.
Fig. 5.—Third pereiopod, × 9·5.
Fig. 6.—Dactyl of third pereiopod, × 19.
Fig. 7.—Fourth pereiopod, × 9·5.
Fig. 8.—Fifth pereiopod, × 9·5.

at Woods Hole. He recognized the correct systematic position of the genus, suggesting that the larval development was very similar to that of *Calliaxis adriatica*



Naushonia portoricensis (Rathbun), female.

Fig. 9.—Third maxilliped, lateral view, × 19.
Fig. 10.—Ischium of third maxilliped, ventral view, × 19.
Fig. 11.—Second maxilliped, × 19.
Fig. 12.—First maxilliped, × 19.
Fig. 13.—Second maxilla, × 19.
Fig. 14.—Mandible, × 50.

Heller (=*Jaxea nocturna* Nardo), one of the two genera now placed in the family Laomediidæ. In the report on the 'Siboga' Decapoda, however, de Man (1920, p. 247) placed both *Naushonia* and *Coralliocrangon* in the Cragonidæ.

Homoriscus portoricensis was described by Miss Rathbun (1901, p. 98) from a female specimen without pereiopods taken at Playa de Ponce, Porto Rico. Apparently because of the presence of podobranchs and epipods, she called the form "a little neighbour of *Homarus*." In 1906 Nobili published Miss Rathbun's affirmation of the presence of podobranchs and epipods in *Homoriscus*. Bouvier (1925, p. 403) included the genus in his list of West Indian Homaridæ, but Balss (1933, p. 86), believing *Homoriscus* and *Coralliocrangon* to be closely related, placed them both in the Cragonidæ. Glassell (1938, p. 414, pl. xxvii.) founded a new species, *Homoriscus macginitiei*, on two ovigerous females taken by Professor G. E. MacGinitie from a small tidal pool at La Jolla, California.

The genus *Coralliocrangon* was briefly diagnosed by Nobili (1904, p. 234) for the reception of *C. perrieri*, specimens of which were collected by Coutière at Djibouti. Two years later (1906) he more completely described this form, but his descriptions and figures leave much to be desired. Finally, Kemp (1916, p. 384) briefly mentioned the Red Sea species and remarked that the "linea thalassinica" placed it somewhat apart from the other members of the Cragonidæ.

A survey of the available information on the four species involved brings out the following characters common to all:—

1. A "linea thalassinica" on the lateral portion of the carapace. (This is not mentioned in the case of *Homoriscus macginitiei*, but it is probably present due to the striking similarity between this species and *H. portoricensis*.)
2. Both branches of the uropods divided by transverse sutures.
3. Incisor process of the mandible and the remaining mouth-parts very similar.
4. First pereiopods subchelate and strikingly alike in all species.
5. Second pereiopods short, simple, with the dactyl densely hirsute.
6. Last three legs slender and simple.

7. Pleopods present on the first abdominal somite of the female only.
8. Rostrum of the same general form and denticulate on the margin.
9. A similar disposition of the carapacic carinæ even though they may be inconspicuous as in *Naushonia crangonoides.*
10. Telson broadly rounded.

The differences between the species seem important at first, but analysis renders them less so. *Naushonia* is said to have a two-jointed mandibular palp, whereas the other two genera have a three-jointed one. However, Thompson (1903, p. 3) states that "the proximal joint may represent two fused joints," and his figures distinctly show an indication of a third segment. The differences between the branchial formulæ of *Naushonia crangonoides* and *Homoriscus portoricensis* may be seen in the formulæ of the two presented below:—

Branchial Formula of Naushonia crangonoides.
(After Thompson.)

	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.
Podobranchiæ.....	ep	1+ep	1+ep	1+ep	1+ep	1+ep	ep	..
Arthrobranchiæ ...	1	2	2	2	2	2	2	..
Pleurobranchiæ ..	..	..	..	..	..	..	..	..

Branchial Formula of Homoriscus portoricensis.

	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.
Podobranchiæ.....	ep	1+ep	1+ep	1+ep	1+ep	1+ep	r+ep	..
Arthrobranchiæ ...	..	2	2	2	2	2	2	..
Pleurobranchiæ ..	..	..	..	..	..	..	..	..

The only differences between the branchial arrangement in these two forms are the presence of an arthrobranch on VII. in *Naushonia* and the presence of a rudimentary podobranch on XIII. in *Homoriscus*. The arthrobranch on VII. might well have been overlooked when I examined the specimen of *Homoriscus*, as Thompson (p. 4) says that it is small. On the other hand, the podobranch on the fourth leg in *Homoriscus* is so rudimentary that it might easily be overlooked. *Coralliocrangon*, however, is said to have six pleurobranchs and no epipods, although Nobili states that the condition of his specimens was too poor to permit an exact determination of the position of the gills. It is difficult to believe that a form which is so similar in every other respect could differ so markedly in the gill-formula. It seems possible that Nobili mistook the dorsal series of arthrobranchs for pleurobranchs and the epipods were either lost or overlooked. If *Coralliocrangon* does prove to be distinct on the basis of the gill-structure, this will probably be the most striking instance of parallelism on record.

The Laomediidæ, as redefined to include these species, is made up of those thalassinids having a "linea thalassinica" and both branches of the uropods divided by transverse sutures. The Naushoniinæ may be distinguished from the Laomediinæ by the subchelate rather than chelate first pereiopods, the well-developed antennal scale which is very rudimentary or entirely absent in the Laomediinæ, and the simple instead of subchelate last pereiopods.

Although a re-examination of the Massachusetts and Red Sea species is needed, the following key may serve to distinguish the four forms. It will be noted that the differences so far as known are not of great importance, certainly no more than would be expected between congeneric species :—

A. Orbital margin and anterior edge of carapace not denticulate; no lateral movable spines on the dactyls of the last three pereiopods.
  1. "Linea thalassinica" pronounced; carinæ of carapace weak; eyes not visible from above .... *N. crangonoides* [Kingsley.
  2. "Linea thalassinica" not pronounced; carinæ of carapace well marked; eyes visible from above.
    a. Rostrum bluntly acute; antennal scale with four or five marginal teeth; telson armed with a single pair of lateral spines. *N. portoricensis* [(Rathbun).

b. Rostrum rounded; antennal scale with seven or eight marginal teeth; telson armed with three pairs of lateral spines. *N. macginitiei* (Glassell).
B. Orbital margin and anterior edge of carapace denticulate; movable lateral spines on dactyls of last three pereiopods .... *N. perrieri* (Nobili).

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LXII.—*The Amphipod* Melita pellucida *new to Ireland and the Isle of Man.* By G. I. CRAWFORD, Assistant Keeper at the British Museum (Natural History).

DURING the summer of 1938 I collected *Melita pellucida* G. O. Sars at Glengariff, County Kerry, and at Castletown in the Isle of Man. At Glengariff it was common among decaying oak-leaves in the River Gariff, in a stretch apparently entered by sea-water at exceptionally high tides only. At Castletown I found a single male in the tidal reaches of the Silver Burn among *Enteromorpha*, and associated with *Gammarus zaddachi*.

Melita pellucida was first known from a brackish basin in Southern Norway, where it lived among a species of *Zostera*, and was described by G. O. Sars (1894). It was next recorded by Gurney (1907) from estuarine water in the River Bure, Norfolk. It is now known also from a number of estuaries in Essex, Devon, and Carmarthenshire, Crawford (1937). The only other recorded locality is the Canal de Caen in Normandy, where Legueux (1926) collected it in numbers from among the bivalve *Dreissensia polymorpha*. It appears, from a consideration of these records and of the new ones here brought forward, that the range of the species is much more extensive than it is supposed to be, and that within its range it will be found to be common in most suitable localities. It is a true member of the brackish-water fauna, and has never been found in permanently fresh water or in the sea. In my experience it is characteristic of water of low and comparatively constant salinity, especially where there is a great deal of detritus of terrestrial origin, such as leaves of trees or dead stems of *Phragmites*.

Melita pellucida is likely to be overlooked owing to its small size (at the most 6 mm. in length) and its general resemblance to *Gammarus* spp. It may be distinguished at first sight from any British species of this genus by its smaller size, its extreme pellucidity, and by its habit when at rest of putting head to tail so that in side view its outline is circular. Diagnostic characteristics under the microscope are the absence, from the dorsal surface of the urosome, of the spinules which are present in *Gammarus*; the shortness of the inner ramus of uropod 3; and the absence at the hinder end of the urosome segments of the posterior dorsal teeth which are a feature of other European species of *Melita*. Sars's illustrations of the animal and its appendages are excellent, and those in Chevreux and Fage (1925, p. 228) are good.

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LXIII.—*Ectoparasites of Australian Birds and Mammals.—I. Two new Species of Mallophaga from an Australian Bird.* By GORDON B. THOMPSON.

[Plate XVII.]

IN a recent paper published in the Proc. Linn. Soc. N.S.W.* I have, in collaboration with my friend Mr. N. J. B. Plomley, presented a list of the insect ectoparasites recorded from Australian birds and mammals. It is my intention to redescribe the greater part of the Mallophaga previously described from this region of the world, to add a number of new species, and to publish any new records of the remaining parasite groups. It is to be hoped that the list already mentioned may stimulate interest in Australian ectoparasites.

For the first contribution to this series I am describing two new species of Mallophaga from the Grey Jumper (*Struthidea cinerea* Gould). This bird appears to be allied to the Corvidæ. The plate and figures, in addition to the brief descriptions, should render the identification of these species an easy matter. For the photographs I am grateful to Dr. J. W. Shackle.

The types of these two species are in the G. B. Thompson coll.

Menopon cinerea, sp. n. (Pl. XVII. fig. 2, and text-fig. 1, *a–c*.)

Type-host.—*Struthidea cinerea* Gould. (Grey Jumper.)

Specimens examined.—♂ allotype, ♀ holotype, and 2 ♀♀, 1 ♂ paratypes from the type-host, New South Wales, Curlewis, 8. iii. 1937.

A moderately pigmented species.

Female.—*Head* almost twice as broad as long; lateral margins gently convex to the temples; temples dilated; gular plate very distinct, the gular bars each bearing one very long seta posteriorly and four shorter ones anteriorly. Antennæ completely covered in dorsally in the antennal fossæ.

Prothorax about the same width as the forehead and as long; two rather short stout setæ in the anterior lateral angles, another similar seta just inside on the dorsal surface. A row of eight longish setæ on the posterior border. Meso- and metathorax gradually becoming wider, bearing few setæ ventrally, hardly any dorsally except the lateral margin of the metathorax, which bears a row of six fairly long setæ. The posterior lateral angles bear two short stout setæ. Legs normal; a patch of small setæ on the posterior femora. Abdomen with tergites fairly strongly sclerotic and pigmented, which are separated from the pleurites by a narrow suture.

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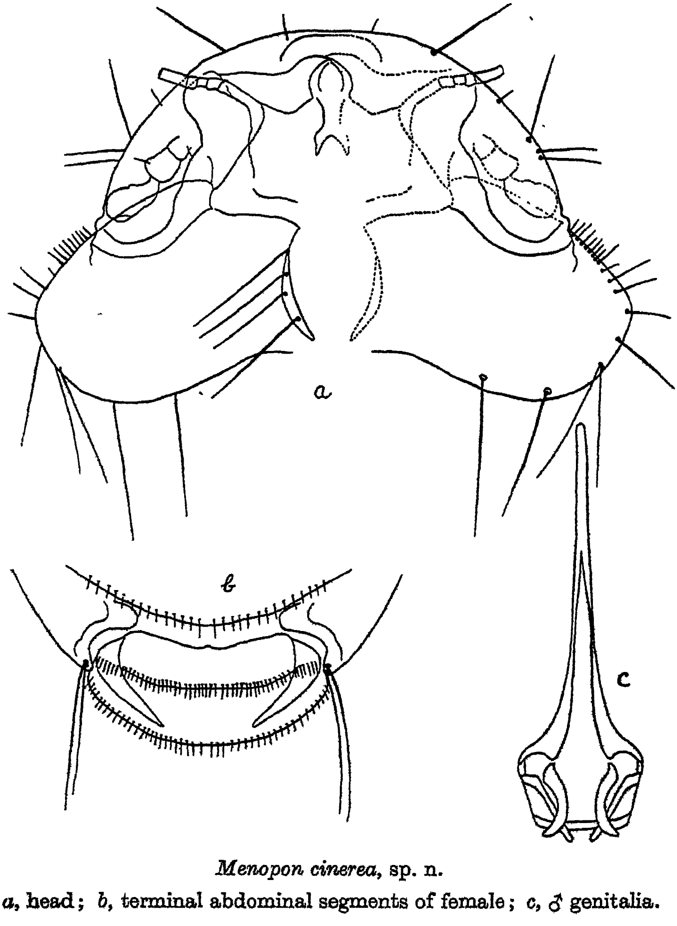
* 1938, vol. lxiii. pp. 105–127.

Text-fig. 1.



Menopon cinerea, sp. n.

a, head; *b*, terminal abdominal segments of female; *c*, ♂ genitalia.

Each paratergite bears a few short and sometimes stout setæ and two longer ones; the long setæ tend to become longer towards the posterior part of the abdomen.

Transverse bands continuous, weakly pigmented medianally and bearing a single row of setæ posteriorly on the dorsal surface. Sternites beset with numerous small setæ; those on the second sternite towards the lateral end are peg-like; the fourth and fifth sternites bear patches of very small setæ. There is a single rather longer seta in the posterior lateral angle of each sternite.

Terminal abdominal segments as in text-fig. 1, *b*.

Length 2·38 mm.; greatest breadth 0·98 mm.

Male.—Very similar to the female. The short peg-like setæ on the second sternite are much more pronounced, whereas the patches of setæ on the fourth and fifth sternites are scarcely recognizable.

♂ genitalia.—See text-fig. 1, *c*. The preputial sac, which is beset with small teeth, is not shown in the figure.

Length 2·1 mm.; greatest breadth 0·7 mm.

This species is not a true *Menopon*, but until such time as we have a better understanding of the species at present placed in the genus *Menopon* I think it is safer to place it in this genus.

Myrsidea struthidea, sp. n. (Pl. XVII. fig. 1, and text-fig. 2, *a–e*.)

Type-host.—*Struthidea cinerea* Gould.

Specimen examined.—♂ type from the type-host (in company with the previous species), New South Wales, Curlewis, 8. iii. 1937.

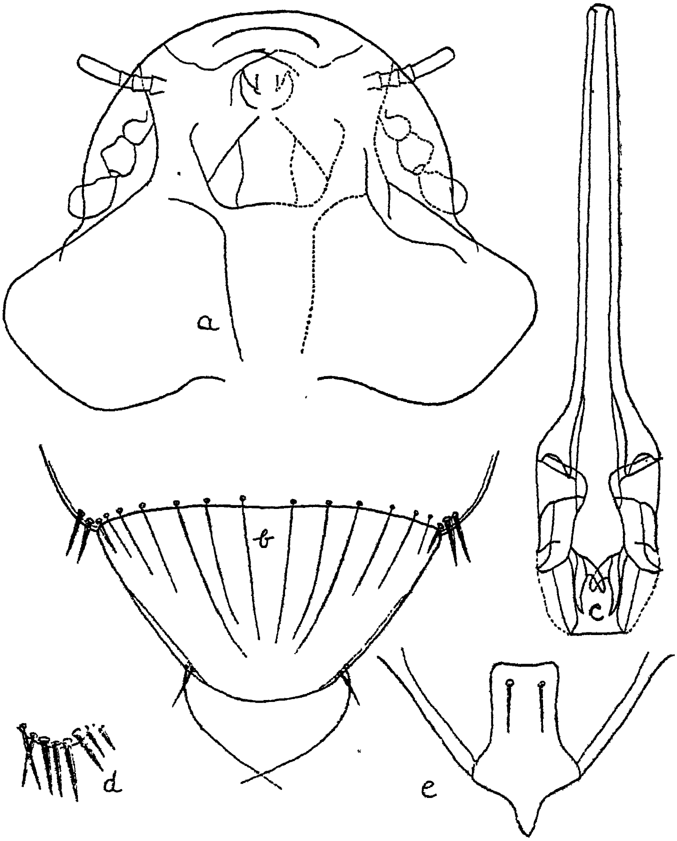
A moderately pigmented species.

Male.—*Head* (text-fig. 2, *a*) of the type common to the genus. Wider than long; forehead semicircular; temples produced, somewhat angular.

Thorax.—Prothorax almost twice as wide as long, narrowing posteriorly. Prothoracic sternite (see text-fig. 2, *e*). Mesothorax about half as long as the prothorax and widening posteriorly. Metathorax longer than mesothorax, about the same width anteriorly as the adjoining part of the mesothorax, and widening posteriorly. Legs normal. Posterior femur with brush of setæ on the venter and two short spine-like setæ on the anterior margin.

Abdomen rather more than twice as long as broad; transverse bands continuous; paratergites separated from the tergites and sternites by narrow sutures. Each sternite bears a single row of setæ, almost equal in length to the width of the transverse bands, along its posterior margin. The lateral margins of the paratergites are more distinctly sclerotized and bear a row of four short, stout, peg-like setæ along the posterior margin. Ventrally

Text-fig. 2.



Myrsidea struthidea, sp. n.

a, outline of head; *b*, terminal abdominal segment of male; *c*, ♂ genitalia; *d*, " aster " of spine; *e*, prothoracic sternite.

the second sternite is produced postero-laterally into a shallow lobe which bears an "aster" of setæ (text-fig. 2, *d*). The fourth and fifth sternites have patches of small setæ. Each transverse band bears a number of small setæ not arranged in any particular order and a posterior row of small setæ which vary in length. The terminal abdominal segment rather long and broad (see text-fig. 2, *b*).

Genitalia (see text-fig. 2, *c*).—A large preputial sac is present (not shown in text-fig.) which bears numerous small "teeth."

Length 1·96 mm.; greatest breadth 0·65 mm.

NOTE.—The genitalia of this species is certainly distinctive (the drawing is made from specimen with genitalia *in situ*), as is also the terminal abdominal segment of the male. Otherwise the species seems to fall within the limits of the genus *Myrsidea*, at least for the present.

EXPLANATION OF PLATE XVII.

Fig. 1. *Myrsidea struthidea*, sp. n., ♂.
Fig. 2. *Menopon cinerea*, sp. n., ♀.

LXIV.—*On the Mantle Cavity, Pedal Gland, and Evolution of Mucous Feeding in the* Vermetidæ. By C. M. YONGE, D.Sc., and E. J. ILES, B.Sc., University of Bristol.

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1. INTRODUCTION.

It was originally suggested by Rougemont in 1880 that *Vermetus gigas* collects planktonic organisms by a unique mechanism of mucous threads. He did not, however, locate the source of these threads. Lacaze-

Duthiers (1860) had described the structure and great size of the pedal gland in *V. triqueter* and Houssay (1884) suggested that this might secrete these feeding threads. But, despite the support of Simroth (1901), the truth of Rougemont's views remained in some doubt until the work of Boettger (1930), who described the whole process in great detail. Three or four mucous threads, extending up to 30 cm., are formed, plankton is caught in these, and then they are drawn back to the mouth and seized by the powerful radula. Boettger found a relation between the time the threads had been out and their withdrawal. He found that secretion of threads was stimulated by the presence of living plankton, and not by dead plankton or by meat juice, and he regarded the pedal tentacles as the site of reception of the stimulus. He also stated that the animal can feed on large prey if this comes within range of the mouth.

The feeding mechanism of *V. novæ hollandiæ* has been described by Yonge (1932, 1938). Here feeding is by means of ciliary currents on the gills essentially as in *Crepidula* (Orton, 1912), and mucous threads are never produced. Moreover, there are many differences between this species and *V. gigas*, notably the presence in *V. novæ hollandiæ* of a round operculum which completely blocks the opening of the tube when the animal is withdrawn. There are also, as will be described later, important differences between the habits of the two species.

Other species of *Vermetus* examined resemble either *V. gigas* or *V. novæ hollandiæ*, e. g., *V. triqueter* has the same general characters as the former and *V. maximus* and *V. gigantus* (specimens of which were kindly supplied by the British Museum (Natural History)), as the latter. In view of the notable differences between these two groups of species it appeared desirable to make a comparison between all structures concerned in any way with feeding, particularly as this might indicate the mode of origin of mucous feeding. The morphology of these organs has been studied by one of us (E. J. I.), while the nature of the organs in the mantle cavity of *V. gigas* (not examined by Boettger) has been studied by the other (C. M. Y.) during a period spent at the Stazione Zoologica, Naples, in April 1938. Acknowledgments are due to Professor R. Dohrn and members of the staff at Naples for their kindness and help, and also to the Colston Research Society of the University of Bristol for financial assistance

2. MATERIAL AND METHODS.

Work has been confined to the two species, *V. gigas* and *V. novæ hollandiæ*, the other species, mentioned above, only being compared with these. Specimens of the former were originally obtained from Naples and later collected personally. They were examined alive and also fixed in Bouin's fluid. *V. novæ hollandiæ* was collected during the course of the Great Barrier Reef Expedition and specimens preserved in Bouin's fluid and in 70 per cent. alcohol. Dissections were made of this preserved material to display the organs in the mantle cavity, the pedal gland and its duct, and the alimentary canal. The pedal gland and various organs in the mantle cavity were sectioned.

3. GENERAL STRUCTURE AND HABITS.

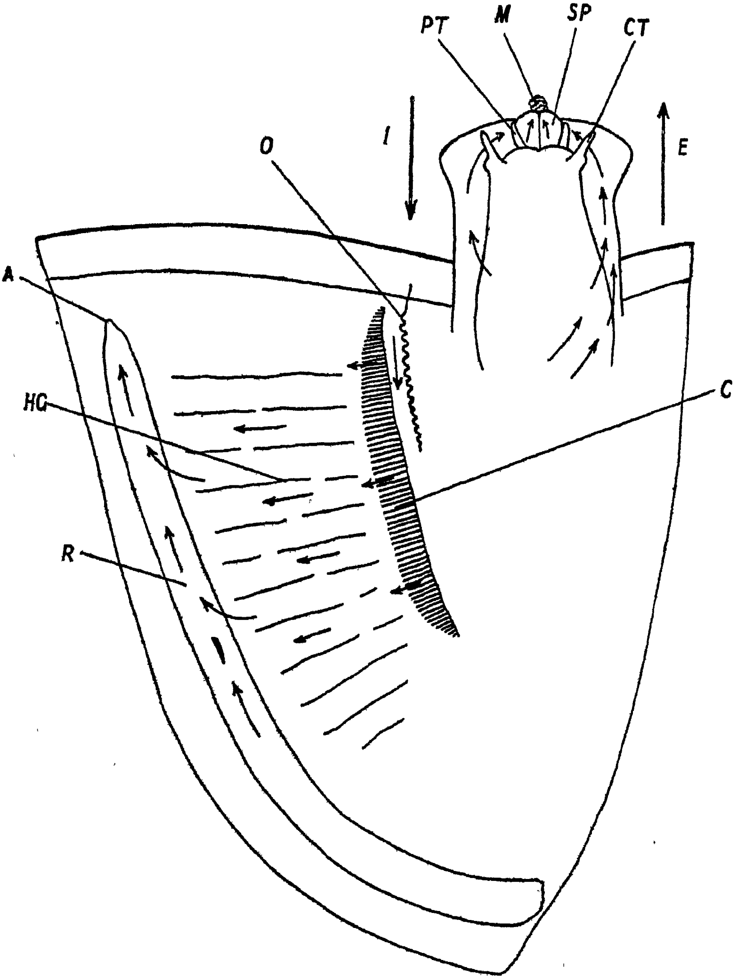
(a) *Vermetus gigas.*—The animals inhabit irregularly twisted shells, those of several animals being usually intertwined in a complicated manner and the whole mass being attached to a hard substratum. The opening of the shell is raised well above the bottom, frequently by as much as 6 cm. The tubes attain a maximum internal diameter of about 1 cm. at the opening. It is difficult to estimate their length owing to the twisting together of the different tubes, but it probably reaches about 20 cm. The animals are brightly coloured, usually in patterns of orange and brown. When the animal is fully distended the mantle-edges line the outer margin of the shell, while the head and the reduced rounded foot extend to between 0·5 and 1 cm. beyond the opening. Under these circumstances the cephalic and pedal tentacles, especially the latter, are capable of great extension. Actually the animals never expanded fully in the laboratory tanks at Naples, but they were later so observed in the aquarium tanks at Monaco. Shallow cavities on the left and right sides of the head constitute the inhalent and exhalent openings respectively of the mantle-cavity. There is no operculum, but the animals retreat for great distances within the shell at the slightest stimulus. This is due to the great powers of contraction possessed by the long thin columellar muscle. An animal which measured 6 cm. after removal from the shell had previously been observed to withdraw for this distance within the shell after stimulation. The animals live exclusively in regions of still water; only under such conditions is feeding by means of mucous threads possible.

(b) *Vermetus novæ hollandiæ*.—A description of this species has previously been given (Yonge, 1932). It differs in many respects from *V. gigas*. The shell is very much thicker, and is never coiled, frequently being almost straight. It is cemented throughout its length and the opening is not raised above the substratum. It is very much larger, attaining a shell-length of 28 cm. with an internal diameter at the mouth-opening of 3·5 cm. The foot secretes a round horny operculum, the surface of which is concave. This fits tightly into the opening of the shell and so limits the extent to which the animal can withdraw. As in *V. gigas* the terminal portion of the shell is cut off by a series of partitions (five in number and occupying 7 cm. of the shell-length in the example mentioned above). The cephalic and pedal tentacles are shorter than those of *V. gigas*, especially the latter. This species was found only on the surface of the outermost reefs on the Great Barrier series. It is one of the few Gastropoda which can withstand exposure to the exceptionally powerful surf, the product of the Pacific swell, which beats on these reefs at low-water spring tides. The shell is so firmly cemented to the dead coral rock that it can only be separated by the use of a hammer and cold chisel. It lives, therefore, in exceptionally turbulent water, and is adapted for life under such conditions.

4. THE MANTLE CAVITY.

(a) *Vermetus gigas*.—The appearance of the mantle-cavity when cut open along the right side and the roof turned back to the left is shown in fig. 1. A weak inhalent current (I) is drawn in on the left of the head. This impinges first on the short, somewhat coiled osphradium (O), which extends for only about half the length of the ctenidium. It has been pointed out elsewhere (Hulbert & Yonge, 1937) that there is evidence that the osphradium is a tactile organ concerned with the estimation of the amount of sediment that enters the mantle-cavity.

Fig. 1.



Vermetus gigas, mantle-cavity exposed by cutting along right side. × 3½.

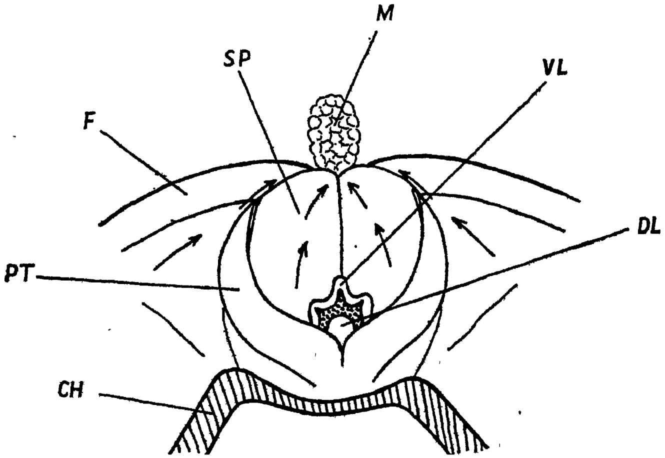
A, anus; C, ctenidium; CT, cephalic tentacle; E, exhalent current; HG, hypobranchial gland; I, inhalent current; M, mucous mass; O, osphradium; PT, pedal tentacle; R, rectum; SP, spongy pad anterior to opening of pedal gland. Arrows indicate direction of ciliary currents.

Since *V. gigas* lives only in very still water in which little sediment will be present, the small size of the osphradium is readily explicable on this theory. The ctenidium (C) has the typical structure of that of a pectinibranch Gastropod. But it does not extend the full length of the mantle-cavity, and the filaments, although numerous, are very small. They are not more than 2 mm. long (in life) in an animal 6 cm. long and 1 cm. in diameter. The ciliation is normal, but weak. Frontal and abfrontal cilia beat to the tip, the latter being weak, the apical cilia are poorly developed and material is carried from them to the region of the hypobranchial gland (HG). There is no current running anteriorly along the tips of the filaments as in *V. novæ hollandiæ* (Yonge, 1932, 1938). Lateral cilia occur, as always, on the region supported by the chitinous supporting rods immediately within the frontal surface. They are difficult to see in life and produce, as already indicated, a very weak respiratory current. The sessile habit of the animal will reduce its need for oxygen considerably. The wide region between the ctenidium and the rectum (R), and constituting the roof of the mantle-cavity, is occupied by a diffuse hypobranchial gland (HG), which is raised into a series of low ridges and extends over the rectum. Sparsely distributed cilia carry particles across to the region of the rectum. Even the slightest stimulus causes copious secretion of mucous. Particles carried on to the rectum are conveyed anteriorly.

The upper surface of the head is not ciliated, but the region behind this possesses sparse cilia, although the greater part of the floor of the mantle-cavity posteriorly is non-ciliated. The heavier particles which fall on to the floor of the mantle-cavity are carried either across to the right side, and then in a groove round the side of the head towards the mouth, or else, if they fall on to the left side, are carried in a similar groove round the left side of the head. Material carried anteriorly along the region of the rectum probably joins the former stream. Both sets of currents are indicated by arrows in fig. 1. In either case the particles eventually collect in a mucous-laden mass in the region anterior to the shield of tissue (SP), which extends anterior to the opening of the pedal gland and between the pedal tentacles (PT) as shown in fig. 2. These masses are, from time to time, seized by the extruded radula and swallowed.

The ctenidial filaments and osphradium are thus both reduced in size in *V. gigas*. Reduction in the former, added to the weak lateral ciliation, is responsible for the very weak respiratory current. This is probably necessary in view of the mode of feeding. A powerful inhalent current would pull the mucous feeding threads into the mantle-cavity and so impede feeding. The reason for the reduction in the osphradium has already been suggested. The feeble inhalent current and the still water, relatively free from sediment, in which the animals must live if they are to feed by means of mucous threads, will account for the sparse ciliation in the roof and floor of the mantle-cavity and on the abfrontal surface of the ctenidial filaments. Such particles as do enter the mantle-cavity appear all to be carried to a common destination anterior to the mouth where they

Fig. 2.



Vermetus gigas, opening of pedal gland and base of tentacles exposed by cutting away anterior region of head. × 7.

CH, cut margin of head; DL, dorsal lip between base of pedal tentacles; F, anterior margin of foot; VL, ventral lip between base of pedal tentacles. Other lettering as before. Arrows indicate direction of ciliary currents.

can be seized and swallowed. Thus, although the gills are reduced and not especially adapted for collecting food-particles, as they are in *V. novæ hollandiæ* and other ciliary feeding Prosobranchia (Yonge, 1938; Graham, 1938), yet the few particles carried into the mantle-cavity by the weak inhalent current *do* form some minor addition to the food collected in the main by the mucous strings. It is probable, however, that particles are not carried in front of the mouth specifically for feeding, but because, owing to the weak exhalent current, this is the most efficient route for their rejection.

It will be clear from the foregoing account that the exhalent current and ciliary currents in the exhalent region will not be sufficiently powerful to expel the fæces. These consist of small ovoid pellets which, in an animal which has not expanded for some time, accumulate in great numbers in the rectum. They are certainly removed as a result of sudden contractions of the anterior region of the body after this has been expanded for some time outside the shell. The result of this is to produce a sudden violent expulsion of water from the exhalent (and also the inhalent) aperture. The fæces, and also any particles in the mantle-cavity, are expelled with this current. The animal reacts in the same way if any abnormally large amount of sediment is introduced into the mantle-cavity by means of a pipette.

(b) *Vermetus novæ hollandiæ.*—The mantle-cavity and its contained organs have previously been described and figured (Yonge, 1932, 1938). Only the characters in which they differ from those of *V. gigas* need be discussed here. The osphradium (erroneously described in 1932 as an endostyle) extends the full length of the ctenidium. This may be correlated with the turbulent water of high sediment content in which this species lives. The ctenidium extends the full length of the mantle-cavity and the filaments are longer and narrower; they were, unfortunately, not measured in life, but after fixation, with its consequent contraction, are still more than twice as long as those of *V. gigas*. They extend almost to the side of the rectum, *i. e.*, effectively divide the mantle-cavity into an inhalent chamber to the left and ventrally, and an exhalent chamber to the right and dorsally. Lateral cilia are well developed and cause a powerful respiratory (and feeding) current; particles are carried to the tips of the filaments by powerful frontal and abfrontal tracts. The apical cilia carry particles anteriorly and work in conjunction with cilia in a food-groove on the right side of the mantle-cavity. There is no definite hypobranchial gland, although mucous gland-cells occur in numbers in the epithelium lining the roof of the mantle-cavity. The heavier particles, which fall out of suspension immediately after they enter the mantle-cavity, are conveyed to the exterior by way of the inhalent current (rejection current A (Yonge, 1938)). The floor of the mantle-cavity is richly ciliated, and carries particles round the right side of the head towards the opening of the pedal gland below the mouth (current B). This material is joined by particles collected, as already described, on the gills (current C) and, after incorporation in the mucus secreted by the pedal gland, all is drawn into the mouth by the action of the radula. The mucus from the pedal gland is used solely to increase the bulk of the mass and so enable the radula to grasp it.

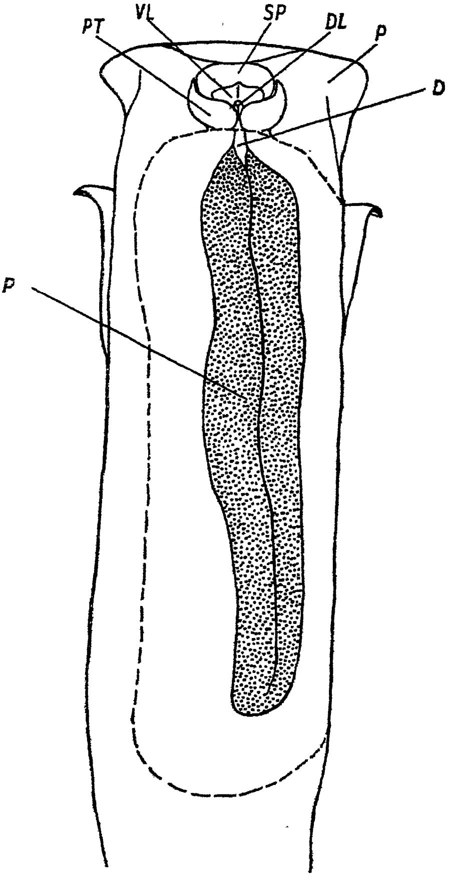
The ctenidia and the mantle-ciliation in general are thus modified in *V. novæ hollandiæ* to enable these animals to exploit two of the primitive rejection currents (B and C) as feeding currents.

5. THE PEDAL GLAND AND ITS DUCT.

The general morphology of the pedal gland in *V. triqueter* was originally described by Lacaze-Duthiers (1860), and its detailed histology by Houssay (1884). There exists, however, no description for any species of the main duct after it leaves the gland, or of its opening to the exterior.

The gland consists of an elongated mass lying within the substance of the foot, ventral to, and slightly to the right of, the œsophagus. It is relatively much larger, both in length and breadth, in *V. gigas* than in *V. novæ hollandiæ* (compare figs. 3 and 4, P). In both it is roughly heart-shaped in transverse section, with the main duct running ventrally along the apex. In neither of the species does it differ histologically from the conditions described by Houssay (1884) in *V. triqueter*. It is composed of a mass of polygonal gland-cells with large nuclei. The secretion from these passes into small ducts, which extend ventrally and inwards, and open into the main duct between ciliated ridges on the ventral side. The dorsal wall of the duct is lined with a non-ciliated

Fig. 3.



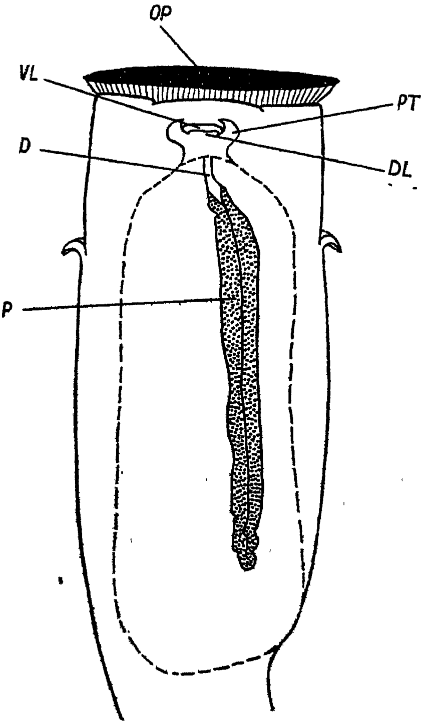
Vermetus gigas, preserved specimen viewed from the dorsal aspect with the pedal gland exposed, extent of dissection which includes the head, indicated by broken line. × 3½.

D, duct of pedal gland; P, pedal gland. Other lettering as before.

cubical epithelium. The ciliated ridges are continuous throughout the length of the duct. In *V. gigas* the floor is raised, forming a median ridge (fig. 5, MR), but in *V. novæ hollandiæ* the floor of the duct is not raised, but there are a pair of high ridges on either side of the mid-line ventrally (fig. 6, LR).

The most striking difference between the two species lies in the nature of the external opening. In *V. novæ hollandiæ* (fig. 7) conditions are the simpler. The duct spreads out anteriorly into a flattened funnel (OD), bounded laterally by the pedal tentacles (PT). The opening is continuous with grooves (G) situated on the inner faces of these tentacles. The funnel is bounded dorsally by a flat lip (fig. 4, DL) which extends between

Fig. 4.

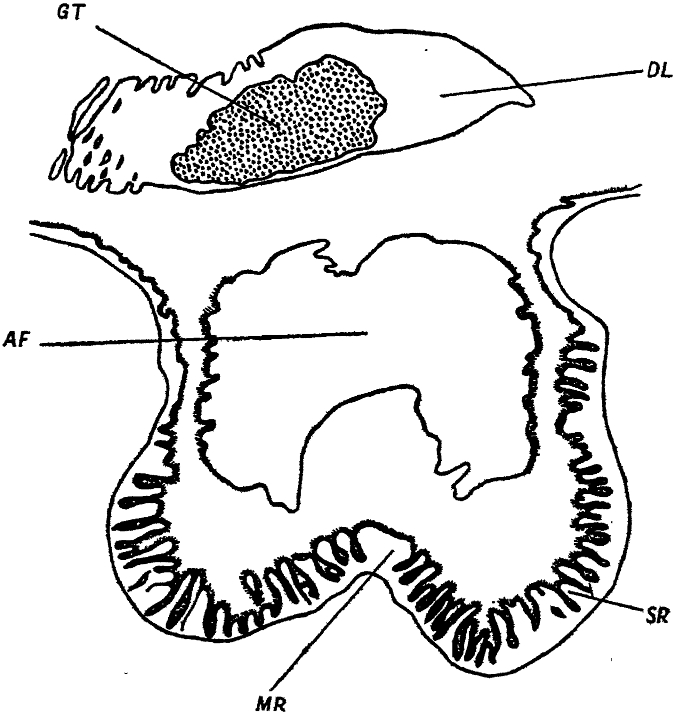


Vermetus novæ hollandiæ, preserved specimen dissected as in fig. 3. × 1½.

OP, operculum. Other lettering as before.

the bases of the tentacles, and ventrally by another lip (figs. 4 & 7, VL), not attached anteriorly to the foot, and extending further forward than the dorsal lip. The lateral ciliated ridges in the duct (fig. 6, LR) diverge about the region of the base of the tentacles, and pass forwards and outwards over the upper surface of the lower lip to merge with the inner edges of the tentacles ventral to the grooves (fig. 7, LR). In fixed material the pedal tentacles and associated structures are drawn back into

Fig. 5.



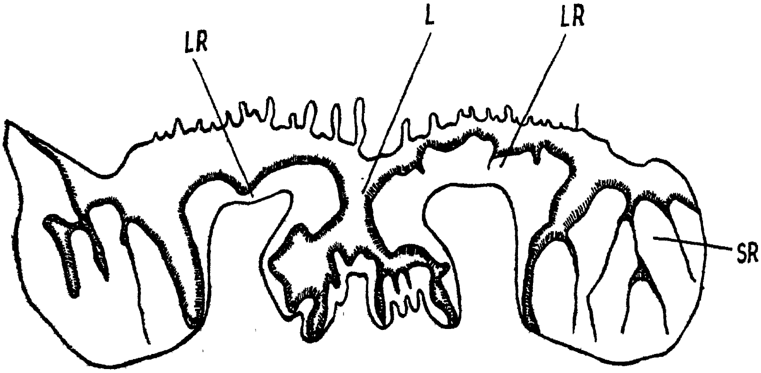
Vermetus gigas, transverse section through the opening of the duct of the pedal gland. × 80.

AF, anteriorly projecting flap from posterior margin of opening (see fig. 8); GT, glandular tissue within dorsal lip; MR, median ventral ridge in duct; SR, secondary ridges. Other lettering as before.

the cavity between the head and the foot on the upper surface of which they lie. In life they are extended, when the animal is feeding, so that the opening of the duct lies slightly anterior to the mouth. The mucus which passes out of the duct collects, as figured previously (Yonge, 1932), in an elongated mass between the base of the tentacles.

In *V. gigas* the pedal tentacles are larger, and capable, in life, of great extension. The grooves (fig. 8, G) are deeper than in *V. novæ hollandiæ*, and are in lateral communication at the base. The duct of the pedal gland opens dorsally at the base of these grooves (fig. 8, OD).

Fig. 6.



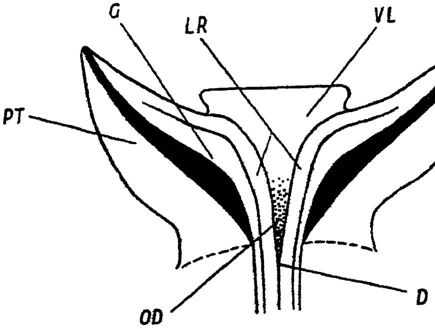
Vermetus novæ hollandiæ, transverse section through the duct of the pedal gland near to the opening. × 80.

L, lumen of duct; LR, lateral ventral ridges. Other lettering as before.

The opening is crescent-shaped owing to presence of a median flap (AF) which extends forwards from the posterior margin of the opening. When examined in section (fig. 5, AF) this flap is revealed as concave ventrally, this concavity lying over the median ciliated ridge in the floor of the duct (fig. 5, MR). The sides of the flap are ciliated. The duct actually continues forward beyond this opening, and becomes divided into two longitudinally, owing to the fusion of the median ridge with the dorsal wall. The two ducts so formed end blindly after a short distance.

The lower lip in *V. gigas* is almost completely fused with the dorsal surfaces of the foot. It extends anteriorly in the form of a broad arrow-head (fig. 8, VL). Anterior to this the surface of the foot is raised into a spongy pad (figs. 2 & 8, SP), covered with ciliated epithelium containing numbers of goblet cells which secrete mucus. The upper lip (figs. 2 & 3, DL) is much smaller than in *V. novæ hollandiæ*, being reduced to a narrow strip of tissue connecting the base of the tentacles dorsally, and projecting to a small extent anteriorly. Within it there extends a mass of glandular tissue (fig. 5, GT). In a young specimen which was sectioned, this region was occupied by a small duct which communicated with the main duct of the pedal gland, and opened to the exterior at the tip of the upper lip.

Fig. 7.

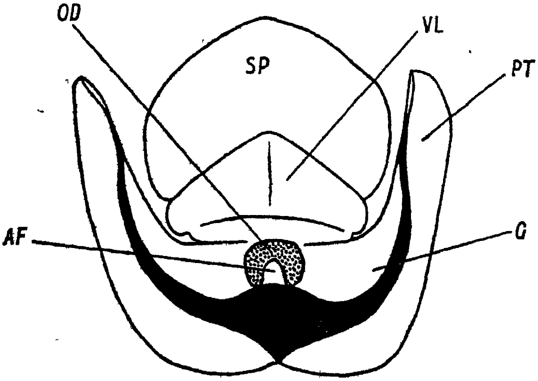


Vermetus novæ hollandiæ, pedal tentacles and opening of duct of pedal gland as revealed by dissection of preserved material, dorsal lip being removed, and also dorsal ridges bounding the grooves in the pedal tentacles, cut surfaces of which are shown black. × 10.

G, groove running along inner side of pedal tentacles ; OD, opening of duct from pedal gland. Other lettering as before.

Examination of these structures in life could only be made on animals which had been removed from their tubes, because they consistently failed to extrude the head end from the opening of the tube when placed in a glass vessel containing sea-water on the stage of a binocular microscope. It was found that cilia on the grooves of the tentacles carry particles anteriorly to the tips. The disposition of the opening of the duct of the pedal gland in relation to these grooves, the presence of the median flap, which will direct the mucus into two lateral streams when it issues from the opening, and the arrangement of the grooves, all indicate that mucus is passed from the duct of the pedal gland *into* the grooves. The pedal tentacles must, therefore, be regarded as the agents responsible for the formation of the long mucous threads by means of which the animal feeds. This will account for the much greater length of the pedal tentacles in *V. gigas* than in *V. novæ hollandiæ.* Moreover, comparison with conditions in the latter shows that the duct of the pedal gland in *V. gigas* has acquired a secondary opening dorsally for this very purpose, the site of the original opening being indicated by the anterior extensions of the duct, which end blindly. The cilia on the spongy pad carry particles anteriorly to the mid-line (see fig. 2). These cilia are probably essentially cleansing in function, but the material they carry meets material conveyed round both sides of the head from the mantle-cavity, as previously described, and may, therefore, from time to time be passed into the mouth together with this.

Fig. 8.



Vermetus gigas, dissected as in fig. 7. ×10.
Lettering as before.

6. THE ALIMENTARY CANAL.

In both *V. gigas* and *V. novæ hollandiæ* the food consists of finely divided material, primarily phytoplankton, massed together in mucus secreted in the main by the pedal gland. The difference between the two lies in the fact that in *V. novæ hollandiæ* this mucus is added after the food has been collected from the water-current which enters the mantle-cavity, whereas in *V. gigas* food is actually entangled by this mucus. In both, the mouth and radula are large, the latter, during feeding, being protruded forward and downward, then opening out and making wide sweeping movements. In this way the food is scooped into the mouth. Peile (1937) has drawn attention to the lack of wear on the teeth of the radula in this genus, which is to be associated with the soft nature of the food-mass. There is little difference between the radula of the two species, although the lateral teeth in *V. novæ hollandiæ* are a little shorter than those of *V. gigas*. This may be correlated with the necessity in the latter for grasping and pulling in the long mucous threads.

The alimentary canal of *V. novæ hollandiæ* has previously been described and figured (Yonge, 1932). It possesses a well-developed crystalline style, which lies in a groove alongside the intestine, with which it communicates by means of a narrow longitudinal slit. Lacaze-Duthier (1860) makes no mention of a style-sac in *V. triqueter*, and initial dissection of preserved material of *V. gigas* failed to reveal one (Yonge, 1932). But further examination of preserved, and later living, material has revealed the presence of a small style and a gastric shield in this species. The style, however, is not so well developed, in relation to the size of the animal, as it is in *V. novæ hollandiæ*. In all other respects the alimentary canal of *V. gigas* agrees closely with that of *V. novæ hollandiæ*. Both are adapted for a similar type of food and, as the presence of a style indicates (Yonge, 1930), there can be no extracellular digestion of protein in the gut. Starch will be digested by the action of the amylase from the style, and small particles ingested and digested intracellularly within the tubules of the digestive diverticula.

7. THE EVOLUTION OF MUCOUS FEEDING.

Before discussing the manner in which the unique feeding mechanism found in *V. gigas* and similar species has arisen, it will be helpful if the principal differences between this species and *V. novæ hollandiæ* are summarized in tabular form. This is done in the Table.

	Vermetus novæ hollandiæ.	*Vermetus gigas.*
Habitat	Turbulent water.	Still water.
Shell	Thick, not twisted, cemented throughout length.	Thin twisted opening not cemented and raised above substratum.
Operculum ..	Present.	Absent.
Feeding	By cilia on gills, mucus from pedal gland provides additional bulk.	By mucous threads secreted by pedal gland. Some additional food from currents in the mantle-cavity.
Ctenidia	Filaments long, apical cilia beat towards anterior.	Filaments short, apical cilia do not beat towards anterior.
Respiratory .. current.	Very powerful, for feeding as well as respiration.	Unusually weak, in correlation with mode of feeding.
Food groove ..	Present.	Absent.
Osphradium ..	Well developed, extends full length of ctenidium.	Reduced, extends only about half length of ctenidium.
Pedal gland ..	Width about one-fifth that of body.	Width almost half that of body.
Opening of pedal duct.	Anterior between tentacles.	Dorsal into base of grooves in tentacles.
Pedal tentacles.	Short.	Long.

It has previously been suggested (Yonge, 1932) that *V. novæ hollandiæ* and allied species arose, as did the other ciliary-feeding Prosobranchia, such as the Calyptræidæ and *Capulus*, from herbivorous style-bearing ancestors which had modified the ciliary currents in the mantle-cavity, originally concerned with the rejection of sediment, for the collection of food. It was further suggested that conditions in *V. gigas* and allied species represent a further modification. The observations recorded in this paper support this view. It is very difficult to visualize how an animal could change its mode of feeding directly from rasping vegetation by means of a radula to collecting plankton by means of mucous strings. But conditions in *V. novæ hollandiæ* indicate how the change may have been brought about.

This species, like the other Prosobranchia mentioned, and also *Turritella* (Graham, 1938), has made the comparatively minor changes in the direction and strength of the ciliary currents in the mantle-cavity necessary to enable it to collect food from the originally exclusively respiratory current. But, despite its sessile habit, it has, unlike these other Prosobranchia, also enlarged the pedal gland, so as to provide sufficient bulk of material to allow the radula, which is notably larger than in the other ciliary feeders, to seize the food-mass. A further development of the gland, added to a change in the position of the opening, and an elongation and some modification of the pedal tentacles, has made possible the extrusion by *V. gigas* of the mucous threads. It has been shown that the opening of the gland in this species is secondary. Feeding by means of these threads can only have become possible owing to an accompanying reduction in the strength of the inhalent current, due to a decrease in the size of ctenidium and of its constituent filaments, which would otherwise have drawn the threads into the mantle-cavity.

This mode of feeding can only be carried out in still water, and must have been evolved by animals which lived under such conditions. In this habitat the shell became lighter, was not cemented throughout its length, and the opening was raised above the bottom. This is clearly a necessary condition for effective feeding by means of mucous threads. The possession of an operculum in *V. novæ hollandiæ* and not in *V. gigas* indicates that the former is the more primitive, this structure being a primitive feature in the pectinibranch Prosobranchia. Its loss in the latter species is probably associated with the obstruction which its dorsal margin would afford to the extrusion and withdrawal of the feeding threads *. The animal has thus come to protect itself by withdrawing far within the cavity of the shell. The alimentary canal remains essentially the same in both species, and is one characteristic of all style-bearing Prosobranchia, animals which are exclusively herbivorous, and feed by ciliary mechanisms or by the slow and almost continuous action of a radula (Yonge, 1932). *V. gigas* will certainly swallow animal matter if this is available or is presented to it, as shown by Boettger (1930), and confirmed by the presence in the stomach of one dissected specimen of a number of small gastropods about 4 mm. long. But there is no evidence that such material can be digested extracellularly, although small particles of animal matter may be digested intracellularly within the cells of the digestive diverticula. Under natural conditions it appears unlikely that actively swimming zooplankton organisms could be caught by the mucous threads, Boettger (1930) having shown that these contain no toxic substance. Phytoplankton organisms may well be collected in abundance by this means.

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* Lacaze-Duthier (1850) states that a small operculum occurs in the middle of foot in *V. triqueter*, but adds that this is " trop petit pour pouvoir fermer complètement l'orifice de la coquille."

It is along such lines that we may account for the evolution of this unique mode of feeding. It has been adopted by Vermetidæ which live in still waters, like *V. gigas* and *V. triqueter.* The remaining Vermetidæ, such as *V. novæ hollandiæ*, *V. giganteus*, and *V. maximus*, have retained the less specialized condition represented by ciliary feeding. It is clearly important that the classification of the Vermetidæ should be revised in the light of these findings.

8. SUMMARY.

1. A comparison has been made between *Vermetus novæ hollandiæ* and *V. gigas* in respect particularly of habitat and mode of feeding.

2. *V. novæ hollandiæ* lives in turbulent water and feeds by means of ciliary currents in the mantle-cavity, notably on the enlarged and somewhat modified ctenidium. It has a stout shell, which is firmly cemented throughout its length and has an operculum.

3. *V. gigas* lives in still water and feeds by means of mucous threads secreted by the enlarged pedal gland. The ctenidium is reduced, only a weak inhalent current being produced, and ciliation in the mantle-cavity is sparse. The shell is thin, the opening being raised above

the bottom, and there is no operculum, the animal retreating far into the shell for protection.

4. The pedal gland in *V. novæ hollandiæ* is large and the duct opens anteriorly between the bases of the short pedal tentacles. The mucus increases the bulk of the food-mass so that it may be secured by the large radula.

5. The pedal gland in *V. gigas* is still larger, the duct opening dorsally and into the base of the grooves within the long pedal tentacles. The latter are probably responsible for the extrusion of the feeding threads.

6. The alimentary canal is essentially similar in both, containing a large radula and also a crystalline style which indicates that, although *V. gigas* will swallow animal matter, extracellular digestion is confined to carbohydrates. Protein, in the form of small particles only, is probably digested intracellularly within the digestive diverticula.

7. The evolution of mucous feeding is discussed and the conclusion reached that it could only have evolved in animals which had first, like *V. novæ hollandiæ*, adapted the ciliary currents on the ctenidium and other regions in the mantle-cavity for feeding purposes and had also retained the pedal gland for assistance in feeding.

8. Other species of *Vermetus* examined resemble either *V. novæ hollandiæ* or *V. gigas*. The Vermetidæ thus appear to be divided into two well-defined groups each with a different habitat and mode of feeding. The classification of the Vermetidæ requires revising in the light of these findings.

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LXV.—*Were there Proboscis-bearing Dinosaurs? Discussion of Cranial Protuberances in the* Hadrosauridæ.

By C. M. STERNBERG *.

IN a recent article under the title "Gab es rüsseltragende Dinosaurier?" (9) Martin Wilfarth discussed at some length the functions of the cranial protuberances of the Hadrosauridæ, and suggested that these Dinosaurs possessed a breathing proboscis. He commented on the lack of opportunity of many of the German palæontologists to study the various species of the Hadrosauridæ or even the published descriptions of some of them.

I concur in his opinion that the protuberances on the skulls of certain Hadrosauridæ were not secondary sexual characters for offensive or defensive purposes, nor were they simply ornaments. I also agree with him that one would expect the development of the premaxillary and nasal bones to be connected with breathing or the sense of smell. I cannot, however, concur in all of his other deductions, and his suggestion that the Hadrosaurs had a proboscis seems highly speculative.

Lambe was the first to show that the narial passages led up into the hood (4, p. 75) in *Lambeosaurus* (*Stephanosaurus*). I have pointed out that the peculiar development of the premaxillary and nasal bones in the Lambeosaurinæ was directly connected with the development of the narial passages and have suggested that the elongated, winding passages, in which air would be trapped, was an adaptation to underwater feeding (8, p. 3).

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Wilfarth's grouping of *Parasaurolophus* with *Saurolophus*, and his suggestion that *Kritosaurus* and *Gryposaurus* should be classified under *Cheneosaurus* shows that he did not fully understand that in the Lambeosaurinæ the premaxillary and nasal bones were folded to enclose the elongated narial tubes and subsidiary air-pockets (8), whereas in *Saurolophus* and *Gryposaurus* there was no such modification of these bones (4). The nasals of *Gryposaurus* had not shifted to any extent, and the stage of development and position of these and the premaxillæ are similar to those in other flat-headed Hadrosaurs, whereas in *Cheneosaurus* these bones have altered their position and become folded to surround the narial passages. The convexity near the posterior extremity of the nasals in *Gryposaurus* is not homologous with the convexity on the top of the skull in *Tetragonosaurus* or *Cheneosaurus*, and the resemblance is wholly superficial. Likewise the protuberance in *Parasaurolophus* superficially resembles that in *Saurolophus*; but the former genus definitely belongs with the Lambeosaurinæ or hooded Hadrosaurs, with shortened head and folded, modified premaxillæ and nasals enclosing the elongated narial passages, whereas in *Saurolophus* and *Prosaurolophus* the premaxillæ and nasals are in a more normal position in front of the skull, and are not folded to enclose the narial passages (4, fig. 38). In most important details the skull of *Saurolophus* resembles that of members of the Hadrosaurinæ. Brown stated (2, p. 391) that the distal end of the ischium of *Saurolophus osborni* was footed, though in the holotype this portion of the bone is missing. Parks described a splendid skeleton of *Prosaurolophus* in which the distal end of the ischium is not expanded (6, p. 35, pl. v.). There seems to be no doubt that *Prosaurolophus* is closely related to *Saurolophus*, and it is rather astonishing that such an important character as the expansion of the ischium should be present in one genus and not in the other.

Wilfarth noted the posterior shifting of the narial openings in the Hadrosaurinæ, and inferred that it was an aquatic adaptation. I have shown (8, p. 8, pl. i.) that in the more highly developed aquatic forms, *i. e.*, the Lambeosaurinæ, the external nares were far forward, and it is my opinion that the same was true of all Hadrosaurs. In his discussion of *Thespesius* (*Claosaurus*) (5, p. 344) Marsh drew attention to "an enormous lateral cavity, which includes the narial orifice, but was evidently occupied in life mainly by the nasal gland, somewhat like that of the existing monitor." We now know that in the Lambeosaurinæ the narial passages were much elongated, folded, and surrounded by thin bone. Is it not possble therefore that in other forms the narial passages were also somewhat elongated and folded within the large lateral cavity though not surrounded by bone? For *Edmontosaurus* (4, fig. 2), and more particularly for *Thespesius saskatchewanensis* (7, pl. xv.), it may readily be assumed that the narial tube lay within the concave lower limb of the premaxilla, and extended posterodorsally until it met the nasal bone, where it arched upward, forward, and downward to the elongate internal nares. This may have been an early stage in elongation of the narial tubes with consequent trapping of the air, leading finally to the highly specialized stage present in the Lambeosaurinæ. In the Lambeosaurinæ the internal nares are less elongate and the prevomers have become shorter and higher.

Wilfarth suggested that the posterior end of the nasals served as attachment for muscles which helped to control the rather large head. In this connection it is worth noting that *Edmontosaurus* had the largest skull of any Hadrosaur and yet there is no spike or hood. Brown suggested that to the crest or spike of *Saurolophus* were attached the upper part of the *complexus digastric* and the *superficial temporalis* muscles (1, p. 133). In some species of hooded Hadrosaurs a backwardly directed spike, composed of nasals or of premaxillæ and nasals, or a rugose area on the expanded nasals, implies muscle attachment. No doubt these supported the same muscle as that attached to the spike of *Saurolophus*. It is possible that the thin, superior edge of the hood or the spike-like crest may have supported a fold of skin which continued along the neck and back.

Wilfarth postulated the theory that the beak and hood were for the attachment of powerful muscles which controlled a proboscis. Even if it were not known that the hood and elongated crest of the Lambeosaurinæ was composed of thin bone which surrounded the narial passages, and it were assumed that it was for muscle attachment, there would still be no evidence to show that an elongated nose or proboscis was present. One would hardly expect animals to develop a breathing proboscis and at the same time highly specialized, elongated, narial passages surrounded by the modified premaxillary and nasal bones.

In mammals which possess a proboscis, the front of the skull is not roofed by the nasal bones, but these are reduced, and the nares (if they should be called such) are pushed far back. In the Lambeosaurinæ the external nares are roofed by bone and, as mentioned above, are located well forward. In the Camptosaurs, Iguanodonts, and Hadrosaurs the beak was fundamentally similar with different types developed for different feeding habits. Probably all had a horny sheath. Practically all palæontologists agree that the Hadrosaurs possessed an expanded duck-like beak and in one case at least, in *Corythosaurus excavatus*, the impression of the horny sheath has been found (8, pl. ii. fig. 1). Such a beak would be quite useless to an animal with a proboscis.

In the many skulls of hooded Hadrosaurs that I have examined I have seen no evidence of muscle attachment areas on the hoods except on the posterior extremity. The rest of the hood is quite smooth, and what might appear to be rugose areas, in illustrations, are really only unossified parts of the bones or depressions above or beyond the swollen portion of the hood which contains the narial tubes and subsidiary air-pockets. In many skulls the thin folded bones of the hood have been flattened by post-mortem crushing. This is probably why some students have restored certain skulls with a thin cockscomb-like crest.

Wilfarth illustrated *Parasaurolophus* with the neck straightened out (9, fig. 2), a position which would have been impossible. The occipital condyle in all the Hadrosaurs faces downward and slightly backward, so that, when naturally articulated, the neck stands almost at right angles to the longer axis of the jaws. Also, if the neck were straightened out the zygapophyses would not articulate with those of the preceding or succeeding vertebra. In practically all Hadrosaur skeletons found naturally articulated the neck is strongly arched, and no doubt such was approximately the normal attitude of the neck in life. This arching of the neck was beautifully shown by Brown in *Corythosaurus* (3, pl. xiii.).

CONCLUSIONS.

One must not depend on superficial resemblances when comparing skulls of the Hadrosaurs. It is definitely known that the peculiarities of the hood in the Lambeosaurinæ were directly connected with the development of the narial passages, and therefore were not developed for muscle attachment such as Wilfarth suggests. One would not expect the development of a proboscis in animals which have elongated narial passages. Likewise a nipping beak and a flexible neck do not seem in harmony with the development of a proboscis.

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LXVI.—*New Tropical African* Curculionidæ (*Col.*).

By Sir Guy A. K. Marshall.

The types of all the following new species are in the British Museum, with the exception of that of the *Ulomascus*.

Subfamily *Brachyderinæ*.

Blosyrus tibialis, sp. n.

♂♀. Black, with uniform dense sandy-brown scales which have a slight coppery reflection.

Head with a broad subtriangular median furrow which is widest behind, the lateral sulci short, interrupted in the middle and obsolete in front, the two raised areas between the three sulci much narrowed behind, the lateral areas on a level with them, broad, almost flat; the eyes less prominent than usual, only narrowly visible from above. *Rostrum* a little broader than long (without the mandibles), parallel-sided, the genæ not projecting; the dorsum flat, with a low narrow, abbreviated median carina which does not bifurcate in front, and on each side of it two shallow irregular longitudinal impressions; the epistome bounded by a sharp curved carina. *Antennæ* with the two basal joints of the funicle equal, the rest more or less transverse and gradually widening distally.

Prothorax transverse (7 : 10), rounded laterally, widest at the middle, not constricted at the apex and the basal constriction very slight, the base arcuate, the gular margin broadly, but shallowly sinuate; the dorsum longitudinally convex, highest at the middle, rugosely granulato-punctate, without any median sulcus or carina, but with a shallow transverse depression on the apical fourth, the whitish or brownish setæ short and subrecumbent. *Elytra* unusually broad, as broad as long in ♂, a little broader in ♀, twice as wide at the rounded humeral prominences as the prothorax, constricted at the base, which is deeply sinuate, with a strongly costate margin (especially in ♀), the line from the basal constriction to the humeral prominence somewhat arcuate, rapidly narrowing behind the shoulders, without any humeral or subhumeral tubercle; the posterior declivity vertical close to the apex; the middle of the disk somewhat flattened as far as interval 5, the broad striæ with large punctures that are partly filled with scaling; interval 2 lower than 3–5, 3 with an obtuse tubercle at the top of the declivity and a smaller one behind it, 5 broadly costate from near the base to the middle and there with a tubercle similar to that on 3 and an obsolete one on the declivity, 7 with a low rounded elevation just before the middle; the intervals with numerous irregular short brown spatulate recumbent setæ, but all the elevations with clusters of longer suberect whitish setæ. *Legs* stouter than usual, with dense uniform scaling and broad scale-like white setæ; the front tibiæ much dilated, triangular in cross-section, with three wide flat faces, the dorsal edge straight, the inner edge strongly arcuate and as wide in the middle as the apex of the femur.

Length 6·0–7·5 mm., breadth 4·0–5·5 mm.

UGANDA: Entebbe, 4 ♂♂, 9 ♀♀, v., viii. 1912 (*C. C. Gowdey*—type). TANGANYIKA TERRITORY: Ukerewe I., 1 ♂ (*Father P. A. Conrads*).

Closely related to *B. ventricosus* Ancey, from Tanganyika Territory, which differs *inter alia* in having the median furrow on the forehead much narrower and the ridges on each side of it scarcely narrowed behind; the prothorax is widest well in front of the middle; the basal margin of the elytra is not costate; and the front tibiæ, though somewhat dilated on the inner edge, are not triangularly compressed.

Blosyrus nudoguttatus, sp. n.

♂♀. Black, with uniform dense sandy-brown scaling, except that the elytra each bear two large subquadrate bare shiny black patches, one just behind the humeral tubercles between striæ 6 and 9, the other at the sides of the posterior declivity between striæ 3 and 6 or 7.

Head with a broad median sulcus, which is somewhat variable but nearly always triangular, with an abbreviated sulcus on each side of it, the intervening ridges narrowed behind, the lateral areas broad, oblong, and flat; the eyes only narrowly visible from above. *Rostrum* transverse, parallel-sided or with the sides shallowly sinuate, the genæ not projecting; other characters as in *B. tibialis*, sp. n. *Antennæ* as in the same species. *Prothorax* transverse (2 : 3), rounded laterally, widest at the middle, not constricted at the apex, shallowly constricted near the base, with the basal angles almost rectangular, the basal margin arcuate, the gular margin rather deeply sinuate; the dorsum gently convex longitudinally, highest behind the middle, rugosely granulato-punctate, very rarely with a short low median carina, the apical fourth somewhat depressed below the level of the disk. *Elytra* subglobose, a little longer than broad (15 : 13), rounded laterally, widest at the middle, constricted at the base, which is sinuate, with the margin costate from interval 3 to the anteriorly projecting basal angle, both sexes with a conical humeral tubercle and a similar one below it on interval 9; the shallow striæ with large punctures partly filled with scaling; interval 3 more or less costate, with a low elevation near the base, a large conical tubercle at the top of the declivity and a smaller one behind it; interval 5 with a low tubercle at one-fifth from the base, then costate to a little behind the middle, the costa ending in a larger subconical tubercle, and another tubercle on the declivity a little behind that on 3; 7 with an obtuse tubercle at the middle; the suture higher throughout than interval 2; all the intervals with very short stout recumbent dark setæ, the tubercles with a group of much longer scale-like suberect white setæ. *Legs* stout with uniform dense brown scaling and broad scale-like white setæ.

Length 5·5–6·5 mm., breadth 3–4 mm.

UGANDA: Entebbe, 6 ♂♂, 17 ♀♀, ix. 1909, v. 1910, v., viii.–ix. 1912 (*C. C. Gowdey*, *Dr. C. A. Wiggins*—type);

Gulu, 2 ♀♀, v. 1925 (*Dr. G. D. H. Carpenter*). TANGANYIKA TERRITORY: Ukerewe I., 3 ♂♂, 3 ♀♀ (*Father P. A. Conrads*).

The four large shiny bare patches on the elytra make this species easily recognisable. The Gulu specimens differ in having on the intervals of the elytra scattered, suberect, white setæ, like those on the tubercles but shorter.

Iphisomus excisipes, sp. n.

♂♀. Black, with dense uniform grey or pale brown scaling in ♂, with a paler stripe on intervals 9 and 10, usually mottled with indistinct paler and darker spots in ♀; scaling on pronotum usually more or less abraded, especially in the middle of the disk; underside with dense pale scaling.

Head with indistinct scattered punctures and slight longitudinal wrinkling, the deep median sulcus extending to somewhat behind the eyes, and a short longitudinal impression near the posterior half of each eye. *Rostrum* narrowing slightly from base to apex, not dilated at the genæ, with a broad indistinctly punctate median depression containing a deep sulcus and two carinæ on each side, the outer rather indefinite, the inner more or less sinuate; the ante-ocular area vertical, rugose, but not sulcate. *Antennæ* ferruginous; the scape reaching the middle of the eye, squamose; funicle with joint 1 shorter than 2+3, 4–7 a little longer than broad. *Prothorax* nearly as long as broad in ♂, a little broader in ♀, rounded laterally, widest far behind the middle, deeply constricted at the base, which is shallowly sinuate or truncate and much wider than the apex; the dorsum with strong subconfluent punctures, which may be almost entirely hidden by scaling, without any granules, the median stria variable, deep and distinct in some specimens, much reduced in others. *Scutellum* small but distinct. *Elytra* rather narrowly subelliptical and widest at the middle in ♂, broader and widest behind the middle in ♀, not constricted at the base, which is jointly sinuate and not (or very slightly) marginate, the ♀ with a small obtuse sub-basal angulation laterally, which is sometimes more or less obsolete, being always absent in the ♂; the fine striæ with small shallow punctures, which are partly covered by scaling; the intervals broad, slightly convex, with dense mosaic-like scaling; the numerous irregular setæ are very short, spatulate and erect, being conspicuous only at the sides and apex. *Legs* with dense variegated scaling; the hind femora much thicker than the middle pair, the front ones about equal to the hind pair in ♀, but distinctly thicker in ♂; only the anterior pairs of tibiæ denticulate internally, the front pair of ♂ not curved inwards at the apex, without any fringe of long hairs, somewhat dilated inwardly near the base, and having at the actual base a deep, almost semicircular excision.

Length 7·0–8·5 mm., breadth 2·5–3·5 mm.

TANGANYIKA TERRITORY: Ukerewe I., 5 ♂♂, 5 ♀♀ (*Father P. A. Conrads*).

The principal distinguishing characters of this species are the punctate (not granulate) pronotum and the unusual structure of the front tibiæ in the ♂.

Subfamily *EREMNINÆ.*

Afrophytoscaphus myersi, sp. n.

♂♀. Derm black, femora piceous, tibiæ, tarsi, and antennæ testaceous; with dense uniform metallic green scaling above, except for three very faint darker stripes on the pronotum; underside with dense grey scaling, the scales at the sides of the metasternum and on the mesepisterna metallic green.

Head densely squamose, forehead flat, with a small median fovea that is normally concealed. *Rostrum* as long as the pronotum, parallel-sided or very slightly narrowing from the base to beyond the middle, dilated at the genæ; the dorsal area shallowly impressed down the middle, with the margins carinate and parallel. *Antennæ* as in the genotype. *Prothorax* slightly transverse, rounded laterally, widest at the middle, distinctly bisinuate at the base; the dorsum with strong separated punctures, the intervals rugulose, and a small low obtuse squamose elevation in the middle line near the base, the punctures almost entirely concealed by scaling. *Elytra* narrow, elongate, very slightly wider at the middle, dehiscent at the apex; the striæ with narrow elongate separated punctures (when the scaling is intact), the intervals with somewhat irregular short recumbent pale setæ in ♂, but in ♀ the setæ become much longer and erect on the declivity. *Legs* as in the genotype.

Length 4·6–5·0 mm., breadth 1·5–1·6 mm.

ANGLO-EGYPTIAN SUDAN: Equatoria Prov., S. Gogrial, 6 ♂♂, 3 ♀♀, ix. 1937, on toich grasses (*Dr. J. G. Myers*).

Very closely allied to the genotype, the only other known species, *A. variabilis* Hust., 1936, but differing in its slightly larger size and more elongate form; also in the elevation at the base of the pronotum and the more strongly-developed postocular lobes. In contrast to the genotype, the colouring appears to be very stable.

Afrophytoscaphus variabilis Hust. subsp. *subvirgatus*, nov.

♂♀. Derm reddish brown, with dense pale arenaceous scaling, having a coppery reflection; pronotum with a broad ill-defined darker stripe on each side and a narrower one in the middle; elytra with intervals 2, 4, and the basal fourth of 5 somewhat darker; underside with dense uniform grey scaling.

Apart from its colouring, which is absolutely constant in the material available, this local race differs from the typical Abyssinian form only in the setæ on the elytra; on the disk these are much shorter and closely appressed (instead of being curved), and on the declivity (in the ♀ only) they are longer, stouter, and suberect.

Length 4·0–4·5 mm., breadth 1·4–1·6 mm.

ANGLO-EGYPTIAN SUDAN: Equatoria Prov., Wun Rog, 6 ♂♂, 3 ♀♀, on torch grass, viii. 1937 (*Dr. J. G. Myers*).

Subfamily *CLEONINÆ*.

Genus HYPOLIXUS Desbr., 1898.

A good deal of confusion has arisen in connection with the use of this generic name. Petri (Wien. Ent. Zeit. xxiii. 1904, p. 185; Bestim. Tab. 55, p. 3) entirely misrepresented Desbrochers' treatment of *Hypolixus*, having evidently confused it with *Gasteroclisus* Desbr. A few pages later he described a genus *Hypolixus*, which he intended to be a new genus (see Ann. Mus. Nat. Hung. x. 1912, p. 340), but inadvertently attributed it to Schönherr, who described no such genus. In his 1912 paper (*l. c.*), he corrected this error, admitting that he had overlooked the real *Hypolixus* of Desbrochers, and sunk *Hypolixus* Petri Nov., 1904 (nec Desbr., 1898), as a synonym of *Gastero-*

clisus Desbr., May 1904. Unfortunately Reitter and two subsequent cataloguers accepted Petri's erroneous attribution of the name *Hypolixus* to Schönherr without any critical examination and ignored his correction; consequently they wrongly sunk *Gasteroclisus* as a synonym of *Hypolixus*, causing quite unnecessary confusion.

The position is really quite simple:—*Hypolixus* was first described by Desbrochers (Frélon, vii. Dec. 1898, p. 54), who fixed the genotype as *Lixus nubilosus* Boh. (erroneously cited in the Zoological Record as *nebulosus* Boh.). *Gasteroclisus* Desbr. (Frélon, xii. May 1904, p. 103, footnote) is quite distinct from it and was based on a single species, *Lixus augurius* Boh., which is thus the genotype.

As a consequence, all the species in the 'Catalogue of Cleoninæ' (Col. Cat. pars 134) standing under *Hypolixus* must be transferred to *Gasteroclisus*, except *achyranthis* Mshl., which was correctly described as a *Hypolixus*; and the name *Hypolixus* Desbr. must be substituted for *Paralixus* Desbr. as used in the Catalogue. Petri employed the names *Hypolixus* and *Gasteroclisus* quite correctly in his revisions of these two genera.

Subfamily *NANONINÆ.*

Nanophyes conradsi, sp. n.

♂♀. Derm honey-brown; prothorax with a large ill-defined round blackish patch occupying the greater part of the disk (sometimes brown and rarely indistinct) and usually a faint blackish patch on the pleuræ, the hairs pale yellowish, becoming mostly black in the middle of the disk; elytra with the following black or brown markings, usually clothed with black hairs: interval 1 with an elongate patch before the middle, a similar one at the top of the declivity, and two small ones behind it; 3 with an elongate patch close to the base, a longer one at the middle, and two faint spots on the declivity; 5 with a small spot near the base, an elongate patch before the middle, and two spots behind it; 9 fuscous throughout or on the basal half, 10 and the lateral margin fuscous on the basal third; a common V-shaped mark of white and yellowish hairs formed by oblique stripes running from behind the shoulder to the middle of the suture, pale yellowish hairs on all the remaining light brown areas; underside testaceous or honey-brown, with rather sparse pale setæ, which are denser at the sides of the meso- and metasterna.

Head with the space between the eyes as wide as the apex of the scape and with dense yellow setæ. *Rostrum* of the same length in the two sexes, longer than the head and pronotum (5 : 4), with the antennæ inserted beyond the middle in both sexes, regularly curved, with four punctate sulci separated by smooth carinæ, the inner sulci more or less interrupted beyond the antennæ, the outer ones continuous almost to the apex. *Antennæ* honey-brown, with the club fuscous ; the proportions of scape, funicle, club as 10 : 7 : 7 ; joint 1 of the funicle longer than 2, 3–5 about as long as broad. *Prothorax* transverse (7 : 10), convex longitudinally, with the sides straight. *Elytra* a little wider at the shoulders than the prothorax, only gradually narrowing behind, with the sides gently rounded, without any basal transverse impression, the scutellar area slightly flattened ; the striæ narrow, with shallow spaced punctures ; the setæ rather coarse and dense, those on intervals 2–4 lying obliquely on the basal half and almost transverse posteriorly. *Legs* honey-brown, the front femora with a large fuscous patch and sometimes also the middle pair, the tibiæ with a dark ring above the middle (conspicuous only on the front pair) and with the apical fringe fuscous ; femora with one long and two short teeth.

Length 2·2–2·9 mm., breadth 1·0–1·5 mm.

TANGANYIKA TERRITORY : Ukerewe I., Victoria Nyanza, 6 ♂♂, 8 ♀♀ (*Father P. A. Conrads*).

Owing to the carination of interval 8 of the elytra at its base, this species comes into the group of *armatus* Boh., being nearest to *nasalis* Mshl. 1927, from S. Rhodesia, which differs *inter alia* in having the rostrum much longer and the elytra more slender, the eyes are narrowly separated, the elytra have a distinct transverse basal impression, and the femora bear four teeth.

Subfamily *ULOMASCINÆ*.

Ulomascus claviger, sp. n.

♂♀. Dark red-brown to piceous-brown.

Head with a well marked neck at the base, the forehead flat, not depressed below the vertex, with large close punctures, the intervals between them finely punctulate, without any median fovea; eyes very prominent, strongly convex, the width across them being much greater than the length of the rostrum (8 : 5). *Rostrum* very slightly broader than long, almost parallel-sided at the base, the genæ obtusely rounded and only moderately dilated; the dorsum quite flat in ♂ and only shallowly impressed in the middle in ♀, strongly and closely punctate, the interantennal area not declivous, quite flat, the apical margin truncate; scrobes passing immediately beneath the rostrum and reaching the hind margin of the eyes; lower surface bare, with rather sparse strong punctures, and with two longitudinal impressions at the base in ♀ only. *Antennæ* with the scape gradually clavate and with rather dense curved setiform scales along the anterior edge; funicle much shorter than the scape (1 : 1·7), with 7 joints, 1 longer than 2+3, 3–7 transverse and closely contiguous; club subcylindrical, very long, twice as long as the funicle. *Prothorax* transverse (1 : 1·3), widest at the base, slightly narrowing in front and with the sides straight from the base to two-thirds, with the apical angles broadly rounded, the base feebly bisinuate, the apex deeply sinuate in the middle only, the dorso-lateral margins not carinate; dorsum moderately convex, with fairly close, small, deep punctures, the intervals finely punctate or rugulose, the disk bare, the lateral margins with dense short yellowish scales. *Scutellum* transversely elliptical, with dense pale scaling. *Elytra* twice as long as the basal width, only slightly wider at the shoulders than the base of the prothorax, parallel-sided in the basal half, a little wider posteriorly, separately rounded at the apex; the 10 striæ containing small close punctures, the intervals somewhat convex in ♀, flatter in ♂, finely aciculate, but rugulose and subgranulate towards the base and along the lateral margins, and there with very small separated pale scales. *Legs* of ♂ very broad and strongly compressed, with separated small pale scales; front femora wider than the others, very similar to those of *U. spathuleus* Ghesq. (Bull. Soc. ent. Fr. xxxix. 1934, p. 197, fig. 1), but the apex of the tooth not produced, the median pair subelliptical and the hind pair suboblong, and both with the dorsal edge sharply carinate; posterior pairs of tibiæ very strongly arcuate dorsally and deepest at one-third from the base, front pair much less arcuate and deepest in the middle ; all the tarsal claws with a very small tooth near the base ; legs of ♀ much narrower and less compressed, the front femora only slightly larger than the others, the posterior pairs not carinate dorsally, the anterior pairs of tibiæ normal and quite straight dorsally as in *U. spadiceus* Ghesq. (*l. c.* fig. 5), only the hind pair slightly arcuate dorsally, the claws of the hind tarsi very aberrant, the inner claw being obsolete and the outer one much longer and broader, strongly compressed and with a rounded laminate dorsal dilatation on the basal half, which bears erect setæ. *Venter* of ♂ broadly excavate throughout.

Length 5·5–6·0 mm., breadth 2·0–2·2 mm.

Kamerun : Johann-Albrechtshöhe, 1 ♂, 2 ♀ (*Conradt*).

Type in the Berlin Museum, cotype in the British Museum.

This small species is readily distinguishable from all its known congeners by its short antennal funicle and very long club, and by the abnormal hind claws in the female. Its nearest ally is the equally small *U. spadiceus* Ghesq., in which the eyes are much less prominent, the funicle has only six joints, and the hind tarsi of the ♀ have two strong claws, the inner one being much thickened.

Subfamily *Alcidinæ*.

Alcides flavoguttatus, sp. n.

♂♀. Body black, except the elytra which are red and shiny, only the apical margin being broadly black ; prothorax with the following yellowish markings (consisting of narrow whitish fimbriate scales covered with yellow powder) : a transverse band in the apical constriction (broadly interrupted dorsally), a similar basal band extending from the lateral margin of the elytra up to stria 5 and there more or less uniting with a round subbasal spot, and a small spot on the median basal lobe ; elytra each with twelve small spots of dense yellow fimbriate scales : one near the base of interval 2, one at the base of 6, an elongate one at the apex of 3, and a round one at the apex of 6–8 (these two often united transversely), interval 2 with a spot at the middle and another behind it, 4 and 6 with one before and another behind the middle (these spots on 2, 4, and 6 forming two oblique parallel rows of three), and 8 with one before and one behind the middle (each a little behind the adjoining spot on 6); underside with dense (less even on venter) yellowish fimbriate scales.

Head with a large deep fovea on the forehead and with coarse confluent punctures which rapidly diminish posteriorly, leaving a small smooth patch above each eye. *Rostrum* cylindrical, as long as the head and pronotum (dorsal view) in both sexes, as wide as a front femur, closely and strongly punctate to the antennæ, the punctures much larger and subconfluent laterally; the dorsal outline continuous with that of the forehead in ♂, straight as far as the antennæ, then curving gradually, the outline in ♀ shallowly sinuate near the base. *Antennæ* inserted beyond the middle in both sexes, black; funicle with joint 1 about as long as 2+3, 3–6 as long as broad and subequal, 7 longer and subconical, attached to the club. *Prothorax* transverse, subconical, widest at the base, very feebly rounded laterally, and scarcely constricted at the apex, postocular lobes obsolescent; the dorsum longitudinally convex, highest beyond the middle, set with low shiny granules similar to but slightly smaller than those of *A. trilobus* F.; the granules on the pleuræ rather larger, flatter, and with a setigerous puncture, but towards the basal angles the granules usually become almost entirely obliterated, only the punctures remaining. *Scutellum* transverse, slightly enclosed laterally by the elytra, with a few rugose punctures. *Elytra* shaped as in *trilobus* but more narrowed behind, with the subbasal depression very shallow or obsolete, and with the shoulders much less prominent; the striæ with moderately large punctures, those in the lateral striæ much smaller, stria 10 complete; the intervals as broad as or broader than the striæ, slightly convex, never costate, very smooth and shining (except interval 1 which is rugulose), and with scattered punctures containing very minute setæ, which only become conspicuous towards the apex. *Legs* with a small triangular tooth on the anterior pairs of femora, that on the hind pair obsolescent; tibiæ with a prominent tooth behind the middle on the front pair only, tibiæ of ♀ all with a strong mucro, front and hind pairs of ♂

with the mucro rudimentary or obsolete. *Sternum* with the metasternum not longer than a median coxa and with a very large granulate prominence laterally.

Length 7·5–9·0 mm., breadth 3·2–3·9 mm.

TANGANYIKA TERRITORY: Ukerewe I., Lake Victoria, 3 ♂♂, 4 ♀♀ (*Father P. A. Conrads*—type). UGANDA: E. Ruwenzori, 6000–7000 feet., 1 ♂, 1 ♀, 1906 (*G. Legge* and *A. F. R. Wollaston*); W. Ankole, 1 ♂, x. 1911 (*Dr. S. A. Neave*); Entebbe, 1 ♀, i. 1912 (*Neave*).

Belongs to the group of *trilobus* F., 1801, being closely related to *geminus* Fst., 1899, which, however, has the elytra less narrowed posteriorly, with deeper striæ and much larger punctures, without the black apical patch and with very different markings.

Subfamily *MENEMACHINÆ*.

Aphyocnemus nyanzæ, sp. n.

♂♀. Rather dull black; head with a band of dense white scales below the eyes; prothorax with a broad lateral stripe of grey scales, which is sharply defined and trisinuate along its dorsal edge and outwardly extends over the whole pleuræ, except for a bare spot near the anterior angles, the disk mostly bare but with traces of a narrow transverse band of scaling behind the middle and a subquadrate patch in the middle of the base; elytra with the basal half yellowish grey with irregular blackish patches, behind this a broad blackish area with a few scattered pale scales, the apical declivity with dense yellowish-grey scaling, the lateral margins rather thinly squamose beyond stria 8; the suture with a subquadrate whitish patch immediately behind the scutellum, followed by an elongate black area, then an oblong whitish patch in the middle, then another black stripe, and finally an apical yellowish-grey stripe of the same length.

Head with the eyes more widely separated than in any of the previously-described species. *Rostrum* of ♂ elongate, strongly curved, with the antennæ inserted at the middle, the basal half with rugose reticulate punctation without any smooth median line, the compressed lateral areas with a shallow longitudinal impression; that of ♀ less coarsely punctate, with the antennæ inserted behind the middle, and without any lateral impression. *Antennæ* red-brown;

scape shorter than the funicle, separated from the eye by about two-thirds (♂) or one-fourth (♀) its own length; club somewhat obliquely attached to the funicle, very elongate, compressed, as long as (♂) or four-fifths of the funicle (♀). *Prothorax* nearly as long as broad, rounded laterally, widest behind the middle, shortly subtubulate at the apex, which is half as wide as the strongly bisinuate base, the dorsum finely and densely punctate. *Scutellum* punctiform, bare. *Elytra* gradually narrowing posteriorly from close behind the shoulders, the posterior calli obtusely prominent, the fine deep striæ with small distant punctures, the intervals distinctly and densely punctate. *Legs* black, with fairly dense yellowish-grey scaling, the tarsi red-brown; front femora with a small setigerous tubercle just beyond the very large sharp tooth; front tibiæ not continuously curved, the dorsal edge curved at the base and then straight; front tibiæ of ♂ with a laminate expansion on the apical half of the lower edge fringed with long hairs, the expansion much smaller in ♀ and without the fringe; front tarsi of ♂ also with a long fringe. *Mesosternum* shallowly depressed transversely in the middle.

Length 6·0–7·5 mm., breadth 2·5–3·1 mm.

TANGANYIKA TERRITORY: Ukerewe I., 1 ♂, 1 ♀ (*Father A. P. Conrads*).

Allied to *A. stigma* Pasc., the genotype, which is a much smaller insect and lacks the white postscutellar patch; the eyes are separated only by a narrow carina; the front tibiæ are strongly curved throughout, without any expansion on the lower edge; the mesosternum is somewhat elevated longitudinally down the middle.

Menemachus chrysophylli, sp. n.

♂♀. Derm red-brown to piceous-brown, with fairly dense narrow pale yellowish scales and very variable darker markings clothed with blackish scales; pronotum with the disk darker on the posterior half, owing to the pale scales being much less numerous, the darker area extending laterally to stria 4 at the base and widening outwards indefinitely at the middle, but divided by a narrow median line of rather denser pale scales; elytra with a short stripe of very dense pale scales behind the middle on interval 1, followed by a somewhat shorter stripe of dense black scales, then an equally long stripe of yellowish scales, the remainder of the dorsum more thinly clothed with pale yellowish scales and with very variable indefinite darker spots and patches; underside with longer yellowish scales and a denser spot at the base of the metepisterna.

Head with the forehead much broader than in any previously-described species, its width being about equal to that of the antennal club, without any median fovea or carina. *Rostrum* as long as the pronotum in ♂, a little longer (6 : 5) in ♀, with three distinct dorsal carinæ in ♂ which entirely disappear towards base and apex, the outer ones converging posteriorly, the punctures rugose and longitudinally confluent throughout, the basal half with rather dense scaling; in ♀ the outer carinæ are absent and the median one is reduced to an abbreviated smooth line, the punctures being much finer apically. *Antennæ* testaceous red, becoming piceous apically; funicle gradually widening distally, with joint 1 a little longer than 2, 4–7 transverse. *Prothorax* parallel-sided from the base to one-third, then narrowing with a curve to the apical constriction, the posterior angles rounded, the median lobe obtuse, the dorsum with an indefinite narrow median carina. *Elytra* without any subapical callus, interval 3 broader at the base than 2 or 4, 6 much narrower than 5. *Legs* with the front femora thicker and with a slightly longer tooth than the others; front tibiæ very shallowly bisinuate on the lower edge, with a sharp mucro, but without any subapical tooth or fringe of long setæ; hind tibiæ almost straight on the lower edge, the fringe of the corbel extending for about two-fifths of the length. *Sternum* with the hind margin of the prosternum truncate in the middle, the mesosternal process arcuate posteriorly.

Length 3·5–4·5 mm., breadth 1·9–2·4 mm.

Sierra Leone: Freetown, 13 ♂♂, 13 ♀♀, bred from seeds of *Chrysophyllum pruniforme*, iii. 1936 (*Van Zwaluwenburg* and *McGough*).

This somewhat inconspicuous insect may be distinguished from all the previously-described species of the genus by its unusually broad non-carinate forehead. In the genotype (*nævus* Boh.) the front tibiæ are very strongly curved throughout and parallel-sided dorsoventrally, with a sparse fringe of long erect setæ on the lower edge and also a large sharp subapical tooth, the true mucro being inconspicuous.

Subfamily CAMPYLOSCELINÆ.

Phaulotrodes conradsi, sp. n.

♂♀. Dull black above, rather thinly clothed with narrow grey scales; pronotum with a broad bare median stripe from the apex to one-fourth from the base; elytra bare on the apical two-thirds of interval 1, and the following elevated areas also more or less bare: the humeral callus, a raised patch on intervals 3 and 4 at one-third from the base, a transverse ridge behind the middle between striæ 1 and 6, the subapical callus; underside mostly bare and more shiny, the pro- and mesosterna sparsely squamose, also the anterior and posterior angles of the metasternum and the sides of ventrite 1, the base of the metepisterna densely squamose.

Head bare, with fine close punctation, the forehead two-thirds as wide as the base of the rostrum, with a very shallow median fovea. *Rostrum* as long as the pronotum, straight and subcylindrical from the base to the antennal insertion (one-third from apex in ♂, two-fifths in ♀), which is slightly dilated, the apical part shallowly sinuate laterally, finely and closely punctate throughout, the punctures smaller in ♀. *Antennæ* as in genotype, but a little shorter and thicker, the distal joints of the funicle being only as long as broad. *Prothorax* a little longer than broad, almost parallel-sided in the basal third, then rapidly narrowing in a curve to the deep subapical constriction, the apex truncate and less than half as wide as the base, which is bisinuate, with the median lobe truncate and broader than the scutellum; the dorsum uneven, finely and densely punctate, with an obtuse longitudinal elevation in the middle, a broad curved longitudinal depression on each side of it, and adjoining this laterally two low obtuse elevations (a large one at the base and a smaller one beyond the middle), and a narrow low smooth median carina from the base nearly to the subapical constriction. *Elytra* 1·6 times as long as broad, a little wider at the shoulders than the base of the prothorax and gradually narrowing behind, broadly rounded at the apex, with an oblique impression at the base between striæ 2 and 4, a broad shallow transverse impression at the middle between striæ 1 and 5, and another behind the middle between striæ 1 and 6; the narrow striæ more or less sinuous, with very shallow small punctures; the intervals uneven, much broader than the striæ, never carinate, finely and densely punctate; the scales small, narrow, recumbent. *Legs* finely and closely punctate, with fairly dense grey scaling; the apex of the tooth on the femora rectangular. *Underside* with the prosternum behind the coxæ flat and not impressed.

Length 13·5–18·0 mm., breadth 5·1–7·0 mm.

TANGANYIKA TERRITORY: Ukerewe I., 3 ♂♂, 4 ♀♀ (*Father P. A. Conrads*).

The only other known species, *P. fåhræusi* Fst., 1898, from West Africa, has the median elevation on the pronotum much higher in the ♀, while in the ♂ it is raised into a very high conical tubercle; the intervals on the elytra are narrowly carinate, 3, 5, and 7 being higher than the others; the prosternum bears a deep longitudinal depression behind the coxæ, etc.

Subfamily *COSSONINÆ*.

COPTOSCAPUS, gen. nov.

Head comparatively short (temples not longer than an eye), not constricted, forehead very broad, but narrower than the base of the rostrum; eyes lateral, not very convex. *Rostrum* short, very broad, compressed dorsoventrally, not dilated at the apex, with a more or less distinct shallow median furrow on the basal half and a shallow impression on each side; scrobes entirely concealed from above, united beneath by a transverse furrow at the base of the rostrum. *Antennæ* inserted at or behind the middle of the rostrum; scape very short and stout, about as long as the two basal joints of the funicle, which is thick, with all the joints transverse and closely packed, 1 being as long as 2+3; club not wider than the funicle, with its basal joint bare and either fully exposed or sunk in the last funicular joint. *Prothorax* very feebly bisinuate at the base, constricted near the apex, which is narrower than the base, evenly covered with large close reticulate punctures. *Scutellum* transverse, slightly concave, with a few shallow punctures. *Elytra* subcylindrical, much wider at the shoulders than the prothorax, truncate and submarginate at the base; the striæ very broad and containing large subquadrate punctures separated by narrow septa, 6 reaching the base, 10 abbreviated; the intervals much narrower than the striæ, costate or carinate, with a row of minute erect setæ, at least posteriorly. *Legs* short and stout; front tibiæ with a very small tooth on the lower edge at one-third from the apex; tarsi very short and stout, joints 1 and 3 about as long as broad, 2 transverse, 3 not wider than 2 and cylindrical, bare beneath except for one seta on each side, 4 parallel-sided or slightly narrower at the apex. *Sternum* with the two anterior pairs of coxæ very narrowly and equally separated; mesosternum depressed; metepisterna extremely narrow in the middle and there impunctate. *Venter* with the two basal ventrites fused.

All the species are dull black, more or less coated with a brown incrustation.

Genotype: *Coptoscapus serratipennis*, sp. n.

An isolated genus belonging to the tribe Rhyncolini (see Proc. R. Ent. Soc. Lond. B, vi. 1937, p. 55), characterised by its broad flattened rostrum, distinctively sculptured elytra, and very short subcylindrical tarsi. *Brachyscapus costipennis* Hust. 1924, from the Congo, must also be referred to this genus.

Brachyscapus Woll. does not belong to the Rhyncolini because the middle coxæ are rather widely separated and stria 6 on the elytra does not reach the base. The form of the rostrum somewhat approximates to that of *Coptoscapus*, but is not so broad, the scrobes are not united below, the club of the antennæ is much wider than the funicle, the elytra have the normal wider intervals and narrower striæ, the front tibiæ have no inferior tooth, the tarsi have joint 3 wider than 2, bilobate and clothed beneath with rather sparse long pubescence, joint 4 very narrow at the base and clavate at the apex, etc.

No external sexual differences have been observed, and all the species are very homogeneous in facies and sculpture.

Key to the Species of Coptoscapus.

1 (4). **Antennal club with its basal joint almost entirely sunk within joint 7 of the funicle, which is much longer than 6.**

2 (3). **Rostrum transverse, roundly dilated laterally in the basal half (forming a**

distinct re-entrant angle with the eye) and sinuate near the apex; elytra with the intervals closely denticulate, especially towards the sides and apex .... *serratipennis*, sp. n.

3 (2). Rostrum as long as broad, gradually narrowing from base to apex, with the sides almost straight and without any re-entrant angle in front of the eye; elytra without any trace of denticulation on the intervals .... *nyanzæ*, sp n.

4 (1). Antennal club well exserted, its basal joint at least as long as the rest together and much longer than joint 7 of the funicle, which is as long as 6.

5 (8). Rostrum roundly dilated in the basal half, much narrower at the apex than at the base; intervals on elytra denticulate behind.

6 (7). Rostrum with the sides not sinuate near the apex, the apical margin asymmetrical, having two projections, of which the right one is the longer; temples shorter than an eye; pronotum with a deep impression in the middle of the base .... *costipennis* Hust.

7 (6). Rostrum with the sides deeply sinuate near the apex, the margin of which is symmetrical, without projections; temples as long as an eye; pronotum without any definite impression at the base .... *umfulensis*, sp. n.

8 (5). Rostrum not dilated basally, the sides almost straight, the apex not or very slightly narrower than the base; intervals on elytra not denticulate.

9 (10). Rostrum with the sides shallowly sinuate near the apex; prothorax slightly longer than broad, widest at the middle; elytra with the punctures in the striæ not larger than those on the pronotum, intervals flatter, each bearing a row of punctures .... *limosus*, sp. n.

10 (9). Rostrum not sinuate laterally; prothorax slightly broader than long, widest well behind the middle; elytra with the punctures in the striæ larger than those on the pronotum; intervals narrower, only 1–3 with a definite row of punctures, the remainder with a narrow sinuous carina .... *katangæ*, sp. n.

Coptoscapus serratipennis, sp. n.

Head with large reticulate punctures, temples as long as an eye. *Rostrum* transverse (8 : 11), roundly dilated laterally in the basal half (forming a distinct re-entrant angle with the eye) and sinuate near the apex, which is narrower than the base and has on its margin two projections, that on the right being the longer. *Antennæ* inserted at one-third from the base of the rostrum; funicle with joint 2 shorter and slightly narrower than 3, 7 as long as 5+6; club sunk in the last funicular joint so as to conceal almost the whole of the basal joint. *Prothorax* slightly broader than long, strongly rounded laterally, widest at a little behind the middle, with a very feeble impression in the middle of the base. *Elytra* with a row of punctures on the intervals, of which the inner edge is denticulate, especially towards the sides and apex; the setæ more conspicuous than in the other species.

Length 3·0–4·6 mm., breadth 1·0–1·6 mm.

ANGOLA: Cabinda Enclave, Mayombe, 29 exx., 1922 (*M. T. Dawe*).

Coptoscapus nyanzæ, sp. n.

Head with the reticulate punctures becoming much smaller and shallower on the vertex, temples slightly longer than an eye. *Rostrum* as long as broad, gradually narrowing from base to apex, with the sides almost straight and without any re-entrant angle in front of the eye, the punctures becoming much smaller and sparser towards the apex, the apical margin feebly sinuate in the middle, symmetrical. *Antennæ* as in *serratipennis*, except that joint 7 of the funicle is a little shorter than 5+6. *Prothorax* as long as broad, much less rounded laterally than in *serratipennis*, widest at the middle, less deeply constricted at the apex, with a shallow impression in the middle of the base. *Elytra* with only the first three intervals bearing a distinct row of punctures, the others reduced to a narrow undulating carina, and the setæ practically obsolete.

Length 4·0–4·5 mm., breadth 1·5–1·7 mm.

TANGANYIKA TERRITORY: Ukerewe I., Lake Victoria, 5 exx. (*Father P. A. Conrads*).

Coptoscapus umfulensis, sp. n.

Head with the temples as long as an eye. *Rostrum* a little broader than long (4 : 5), the sides roundly dilated at the base (but without any basal re-entrant angle) and deeply sinuate apically, the apical margin symmetrical, regularly arcuate; the dorsal punctures for the most part longitudinally confluent. *Antennæ* inserted at one-third from the base of the rostrum; funicle with joint 2 much shorter and slightly narrower than 3, 7 about as long as 6; club fully exserted, the basal joint much longer than the rest and also longer than 7 of the funicle. *Prothorax* as long as broad, rather strongly rounded laterally, widest at the middle, deeply constricted near the apex, very feebly impressed in the middle of the base. *Elytra* with distinct rows of punctures only on the first two intervals, the others sinuously carinate, becoming obtusely denticulate posteriorly.

Length 4·0 mm., breadth 1·5 mm.

S. Rhodesia: Umfuli R., Gadzima, 1 ex., xi. 1895 (*G. A. K. Marshall*).

Coptoscapus limosus, sp. n.

Head with the temples a little longer than an eye. *Rostrum* about as long as broad, with the sides almost straight, but shallowly sinuate at the apex, which is a little narrower than the base, the apical margin sinuate in the middle, with the angle on the right side a little more prominent; the median sulcus rather deeper than in the other species and the punctures smaller, especially towards the apex. *Antennæ* inserted slightly behind the middle of the rostrum; funicle with joint 2 equal to 3, 6 equal to 7; club with its basal joint exposed, longer than 7 of the funicule. *Prothorax* as long as or slightly longer than broad, moderately rounded laterally, widest at the middle, the apical constriction not very deep and the basal impression obsolescent. *Elytra* with rows of punctures on all the intervals, which are rather flatter than usual and show no signs of denticulation; the punctures in the striæ comparatively smaller and more rounded than in any of the other species, being no larger than those on the pronotum.

Length 4·0 mm., breadth 1·5 mm.

S. Rhodesia: Salisbury, 1 ex., xi. 1900, under bark (*G. A. K. Marshall*), 1 ex., iii. 1920 (*Father J. A. O'Neil*—type).

Coptoscapus katangæ, sp. n.

Head with the temples as long as an eye. *Rostrum* as long as broad, with the sides straight, the apex scarcely narrower than the base, the apical margin very shallowly sinuate in the middle, with the right side very slightly more prominent. *Antennæ* inserted at the middle of the rostrum ; funicle with joint 2 equal to 3, and 6 equal to 7 ; club with the basal joint exserted and twice as long as 7 of the funicle. *Prothorax* very slightly broader than long, moderately rounded laterally, widest well behind the middle, with the apical constriction rather deep and the basal impression obsolescent. *Elytra* with a row of punctures on only the first three intervals, the remainder with a sinuous carina without any trace of denticulation.

Length 3·0–3·5 mm., breadth 1·0–1·3 mm.

BELGIAN CONGO : Katanga, Elizabethville, 3 ex., iii. 1928 (*Dr. H. Silvester Evans*).

Notes on Homonyms, etc.

BRACHYDERINÆ.

Astycus Schönh., 1826, is preoccupied by Hübner, 1823 (Lep.), and *Lepropus* Schönh., 1826, must be substituted for it.

OTIORRHYNCHINÆ.

Brachymiscus, nom. nov., for *Brachycaulus* Mshl., 1916, 1916, nec Fairm., 1843 (Col.).

Brachycyclus, nom. nov., for *Brachycyrtus* Fairm., 1886, nec Kriechb., 1880 (Hym.).

Nematocerus Rch., 1850, should be used instead of *Tanycerus* Lac., 1863, because Lacordaire was not justified in altering Reiche's name owing to the name *Nematocera* having been used by Meigen in Tipulidæ.

Myllocerus jacobsoni Suv., 1915 (cotype seen), is a *Polydrusus* and synonymous with *P. obesulus* Fst., 1882.

Myllocerus ruralis, nom. nov., for *rusticus* Fst., 1897, nec Pasc., 1869.

Myllocerus delectans, nom. nov., for *delicatulus* Fhs. 1871, nec Boh., 1843.

LEPTOPINÆ.

Conidus, nom. nov., for *Conus* Kessel, 1935, nec Linn. 1758 (Mollusca).

Conoclœus, nom. nov., for *Conothorax* Kessel, 1935, nec Jekel, 1853 (Curc.).

Promecodes, nom. nov., for *Promecopsis* Champ., 1911, nec Dumeril, 1806 (Hemipt.).

THECESTERNINÆ.

Cyphomastax, nom. nov., for *Cyphorhinus* Perris, 1864, nec Cabanis, 1844 (Aves).

AMYCTERINÆ.

Brachyrothus, nom. nov., for *Brachymycterus* Ferg., 1915, nec Heyden, 1866 (fossil Œdemerid).

RHYPAROSOMINÆ.

Bæomorphus, nom. nov., for *Bæosomus* Broun, 1904, nec Thomson, 1891 (Hym.).

CLEONINÆ.

Lixopachys Reitt., 1916, must be substituted for *Cylindropterus* Chevr., 1873, nec Mots., 1863.

ERIRRHININÆ.

Brachygyius, nom. nov., for *Brachypus* Schönh., 1925, nec Meigen 1924 (Dipt.).

Conomycter, nom. nov., for *Conorhinus* Schönh., 1836, nec Cast., 1832 (Hemipt.).

AMALACTINÆ.

Platyphœus was erroneously described by Pascoe (1875) as belonging to the Baridinæ, whereas it is really a synonym of *Tranes* Schönh., and *P. lyterioides* Pasc. is a synonym of *T. sparsus* Boh.

PETALOCHILINÆ.

Balanœcus, nom. nov., for *Balanephagus* Schönh., 1843, nec Morris, 1837 (Aves).

ANTHONOMINÆ.

Cionomimus, nov. nov., for *Cionistes* Dietz, 1891, nec Wright, 1861 (Prot.).

ALCIDODINÆ.

Alcidodes, nom. nov., for *Alcides* Schönh., 1826, nec Hübner, 1822 (Lep.).

CRYPTORRHYNCHINÆ.

Apocallus, nom. nov., for *Acacallis* Pasc., 1883, nec Hübner, 1823 (Lep.).

Brachyphyes, nom. nov., for *Brachycis* Lea, 1913, nec Casey, 1910 (Cioidæ).

Byrsodes, nom. nov., for *Byrsia* Pasc., 1883, nec Walker, 1864 (Lep.).

Chleuasmus, nom. nov., for *Chleuastes* Kirsch, 1869, nec Hübner, 1822 (Lep.).

Cleodus, nom. nov., for *Cleobis* Pasc., 1855, nec Dana, 1847 (Mollusca).

Conotypus, nom. nov., for *Conopsis* Chevr., 1877, nec Günther, 1858 (Reptilia).

Cryptotelus, nom. nov., for *Cryptacrus* Kirsch, 1869, nec Mayr, 1864 (Hym.).

(*Monaulax* Roel., 1875) = *Mechistocerus* Fvl., 1862.

Idotasia Pasc. 1871 has been used in the Cat. Coleopt. (parts 136 and 151) to replace *Trigonopterus* Fvl. 1862 on the ground that the latter is preoccupied by *Trigonoptera* Perr. 1855; but according to the International Rules these two names are not homonymous, and *Trigonopterus* is the correct name for this genus.

ISORRHYNCHINÆ.

Conoderes Schönh., 1833, is available for *Conophorus* Schönh., 1838, nec Meigen, 1803 (Dipt.).

Lobotrachelus (*argenteolus* Fst., 1899 =) *incallidus* Boh., 1844 (type seen). Boheman's description is rather misleading; he evidently overlooked the blue-black scales on the elytra, which are not at all conspicuous on the black background.

CEUTHORRHYNCHINÆ.

Acantharthrus, nom. nov., for *Acanthoscelis* Dietz, 1897, nec Dejean, 1825 (Carabidæ).

BARIDINÆ.

Ipsichora leai, nom. nov., for *tibialis* Lea, 1931, nec 1927.

CALANDRINÆ.

Liocalandra Chevr., 1881, must be substituted for *Cyrtorhinus* Lac., 1866, nec Fieber, 1848 (Hemipt.).

LXVII.—*The Australian Species of the Genus* Acanthaclisis *Rambur* (*Neuroptera*, Myrmeleonidæ). By D. E. Kimmins, Department of Entomology, British Museum (Natural History).

[Plates XVIII. & XIX.]

The examples upon which this short paper is based are mainly in the collection of the British Museum, which has recently been augmented by the purchase of the McLachlan collection. From time to time various specimens had been incorporated as one or the other of the two Australian species of *Acanthaclisis* described by Walker (*fundata* and *subtendens*), and in consequence both species were represented by rather mixed series. The acquisition of additional material in the McLachlan collection seemed to provide a favourable opportunity for revising our collection, and as a result I am able to reinstate one of Gerstaecker's species and to describe three new species. Considering the restricted genus (excluding *Mestressa* Banks and *Cosina* Navás) we have now eight species from Australia, a figure which will undoubtedly be increased, as there are two defective examples in the British Museum collections which probably represent two more new species.

As far as I know only one species (*A. fundata*) appears to be widely distributed in Australia, the others being apparently restricted to Western or Northern Australia.

Acanthaclisis fundata (Walker). (Pl. XVIII. fig. *c*.)

Myrmeleon fundatus Walker, 1853, List Neur. Ins. B.M. ii. p. 321.
Acanthaclisis fundata (Walker) Hagen, 1866, Stett. Ent. Z. xxvii. p. 378; McLachlan, 1868, J. Linn. Soc., Zool. ix. p. 276; Esben-Petersen, 1915, Proc. Linn. Soc. N.S.W. xl. p. 61, pl. vii. fig. 8; id. 1918, Ark. f. Zool. xi. p. 22; id. 1923, Proc. Linn. Soc. N.S.W. xlviii. p. 590.

I give Walker's description, with my own notes on the type enclosed within brackets [ ].

"*Cinereo-ferrugineus; caput subproductum, antice et subtus testaceum, vertice nigro bifasciato; palpi testacei, labiales apice ferruginei; antennæ nigræ, clavatæ, albido annulatæ; thorax nigro quinquevittatus; abdomen nigrum; pedes ferruginei, validi, nigro varii, tarsis nigris albo cinctis; alæ hyalinæ, angustæ, apice vix angulatæ, anticæ apicem versus fusco vix notatæ.*"

"Dark ferruginous, stout, tinged with gray, clothed with whitish hairs: head testaceous in front and beneath; vertex with a slight longitudinal furrow and with two black bands [transverse and linked along the furrow]; epistoma and mouth prominent; palpi testaceous; third joint of the labial palpi ferruginous [labial palpi missing]: antennæ black, slender, clavate, reddish towards the base in the male, much shorter than the thorax [only a fragment of one antenna now remaining]; tips of the joints whitish: thorax with five black stripes, the middle one broad and subdivided, the others slender and interrupted [subdivision of median stripe obscure]: prothorax much narrower in front, a little longer than broad: abdomen black [dark ferruginous, a yellowish stripe beneath, and a small spot on the apical lateral angles of seventh tergite], much shorter than the wings: appendages [of ♂] short [cylindrical], ferruginous beneath, armed with reverted spines: legs ferruginous, stout, hairy, more or less marked with black which mostly prevails on the fore-legs; tarsi black; fifth joint very long [equal to 1–4], white towards the base [joint 1 in hind tarsi also whitish]; spurs reddish, slightly curved, not angular, as long as the first three joints: wings hyaline, narrow [possibly variable; I have seen several examples with broader and less pointed wings], rather short, very obtusely angular at the tips; stigma whitish, with a small adjoining brown spot which is occasionally obsolete; veins alternately black and white, wholly white in some limpid parts; subcostal region very narrow at the base of the wing; areolets [fore wing] divided by transverse veinlets from near the base to the stigma, veins with one or no forks between the base and the stigma; marginal region narrow: fore wings with a slight brown mark by [anterior to] the cubitus in the disk and two or three by that vein beyond, forming a slight oblique streak opposite the stigma, these marks are occasionally obsolete; [in the apices of both wings the gradate cross-veins tend to run parallel to the anterior Banksian line; anterior to this line, there is often an indication of a faint smoky streak parallel to, and separated from it by a hyaline area; area between Cu_1 and Cu_2, the intercubital, not very wide, partly bi-areolate :] hind-wings shorter and narrower than the fore-wings, without marks [other than the dark patches on the veins; in the radial area near the base there is generally an accessory veinlet, linking the cross-veins, parallel and close to the radius]; veins mostly white. Length of the body, 14–20 lines; [expanse] of the wings 40–52 lines."

Of the four specimens listed by Walker I select as *type* his specimen *b*, a male from West Australia. Specimen *c* is larger than the type, is labelled "Van Diemen's Land," and is of the form with rather broader and less pointed wings. Specimen *a*, from Port Curtis, Queensland, is not conspecific, and belongs to *Acanthaclisis conspurcata* Gerst. Specimen *d* (without locality) is now missing.

This appears to be the most widely distributed of the Australian *Acanthaclisis* and is recorded from the following localities:—

N. AUSTRALIA: Alexandra. QUEENSLAND: Dawson. W. AUSTRALIA: Nicol Bay, Derby, Swan River, Freemantle. S. AUSTRALIA: Adelaide. VICTORIA: Melbourne. NEW SOUTH WALES: no other data. TASMANIA: Hobart Town.

Acanthaclisis conspurcata Gerstaecker. (Pl. XIX. fig. *c*.)

Gerstaecker, 1885, Mitt. nat. Ver. Neuvorp. Rugen, xvi. p. 88; Weele, 1908, Notes Leyden Mus. xxx. p. 60.
=*Myrmeleon fundata* Walker (partim), 1853, List. Neur. Ins. B.M. ii. p. 320 (spec. *a*).
=*Acanthaclisis subtendens* Esben-Petersen, 1915, Proc. Linn. Soc. N.S.W. xl. p. 61, pl. vii. fig. 7; id. 1918, Ark Zool. xi. p. 22; id. 1924, Proc. Linn. Soc. N.S.W. xlviii. p. 590.

This species more closely resembles *A. fundata* than *A. subtendens* in general appearance. Strongly marked examples are easily separated by the piceous spots on the radius, cubitus, and hind margin. Examples without these spots may be distinguished by the weak posterior Banksian line in both wings, the posterior branch of Cu_1 in anterior wing running straight to the margin, and the absence of any secondary vein in the basal radial area of the posterior wing. The marginal forks in the apical parts of the wings are definitely longer than in *fundata*.

This species appears to be restricted in its distribution to Queensland and N.W. Australia.

Acanthaclisis subtendens (Walker). (Pl. XIX. fig. *a*.)

Myrmeleon subtendens Walker, 1853, List. Neur. Ins. B.M. ii. p. 321.
Acanthaclisis subtendens (Walker), Hagen, 1866, Stett. Ent. Z. xxvii. p. 379; McLachlan, 1868, J. Linn. Soc., Zool. ix. p. 276; *nec* Esben-Petersen, 1915, Proc. Linn. Soc. N.S.W. xl. p. 61, pl. vii. fig. 7.

The following is Walker's description, with my own comments on the type enclosed in brackets [ ].

"*Ferrugineus, subrobustus ; caput flavum, supra nigrum ; palpi labiales 3o piceo ; thorax nigro sexvittatus ; prothorace antice angustior ; abdomen nigrum, segmentis apice testaceis ; pedes nigri, testaceo varii ; alæ albidæ, perangustæ, lanceolatæ, sat breves, cinereo subnebulosæ, anticæ nigro notatæ.*"

"Ferruginous, clothed with white [and black] hairs, rather stout [now somewhat obscured with moulds]: head black above, slightly produced in front, yellow in front and beneath: palpi yellow; third joint of the labial palpi pitchy except at the base and at the tip: [antennæ lacking :] thorax with six slight indistinct black stripes: prothorax much narrower in front, broader than long on the hind border: abdomen black, very much shorter than the wings; hind borders of the segments ferruginous: legs black, rather stout; femora at the base, hind-femora also above, hind-tibiæ and coxæ testaceous [hind-tibiæ yellowish rather than testaceous]; tarsi and anterior tibiæ with two testaceous bands [median tibiæ with three]; spurs ferruginous, curved, longer than the first joint of the tarsus [about as long as 1+2]: wings whitish, very narrow, rather short, lanceolate, rounded at the tips, slightly mottled with gray; stigma whitish, slight, with a small adjoining black spot; veins alternately black and white; forks of the marginal region very narrow: structure of the forks of the radial sector like that of *M. rapax* and *fundatus*: fore-wings with the subcostal areolets regularly divided by oblique transverse veinlets, but with no forked veins from near the base to the stigma; [a number of short brown streaks in the subcostal area ;] some little blackish marks along the cubitus and on the tip of its fork, and on two veinlets in the disk opposite the stigma [intercubital area not very wide, partly biareolate;]: hind-wings less mottled, narrower and much shorter than the fore-wings; subcostal areolets upright from the base to one-third of the length where they decrease in size, from thence to the stigma they are larger and successively more and more oblique; all of them simple and with no forked veins. [Veins in the radial area before the origin of *Rs* simple and four in number.] Length of the body 15 lines; [expanse] of the wings 40 lines."

Type, a female from West Australia.

Dr. P. Esben-Petersen placed Gerstaecker's *A. conspurcata* as a synonym of this species, but this is due to an error in his identification of *A. subtendens* (Walker), the type of which he had not seen.

Acanthaclisis tillyardi, sp. n. (Pl. XIX. fig. *b*.)

Closely related to *A. subtendens* (Walker), but differing in a number of small points.

The wings are relatively broader, not lanceolate, apex more obtuse, more evenly mottled, the posterior margin distinctly angulate before the apex. In the anterior wing the posterior row of areolets formed by the costal cross-vein and the row of oblique inter-veinlets are about as long as wide. Anterior Banksian line, if produced, terminating in costa before apex of wing. No well-defined brown streaks on membrane before cubitus. Posterior branch of Cu_1 angled (not arched) near its apex. Posterior Banksian line more distinct. Costal veinlets in posterior wing less bunched together in basal third. Distinct brownish shading about the termination of *M* and *Cu*.

Median dorsal stripe of prothorax not divided ; anterior transverse furrow more pronounced. White hairs on pronotum largely absent. Spurs of tibiæ as long as first three tarsal segments. Underside of femora more heavily spined.

♂. A tuft of long black silky hairs arising from between the sixth and seventh tergites, a little longer than the seventh tergite. Appendages longer than segments eight and nine, cylindrical, ferruginous, with black setæ.

	♂ (mm.).	♀ (mm.).
Length of anterior wing	45	44
,, ,, posterior ,, ...	40	39
,, ,, body	45	37

W. AUSTRALIA : type ♂, Yanchep, 32 miles N. of Perth, 9–23.i.36 (*Miss Raymond*), in the British Museum; paratype ♀, Swan River, in the Hope Department, University Museum, Oxford.

Acanthaclisis acuta, sp. n. (Pl. XVIII. fig. *b*.)

Specimens very faded, prothorax and apex of abdomen of male missing ; in the female, of which the body is in better preservation, the head is brownish above, yellowish in front. Antenna rather short, brownish, paler basally. Thorax tawny-yellow, with brownish stripes; prothorax with five stripes, the median widest, intermediate narrow, obsolete basally. Abdomen brownish, with a pair of tawny-yellow irregular stripes along the dorsal surface. Male appendages missing.

Wings narrow, with apices acute in male, less so in female. Venation brownish, with some scattered areas of pale veins. Stigma of fore wings with a conspicuous brown streak anteriorly. In fore wing faint brownish streaks along Cu_{1a}, a brown spot at the apex of Cu_2, and the anal margin from this spot to the base brownish. Intercubital area moderately broad, not bi-areolate; lower branch of Cu_1 slightly bent near its apex. Banksian lines distinct; area between Cu_{1a} and Banksian line in fore wing rather broad, and in its apical half traversed by unicellular rows. Marginal forks, especially in fore wing, rather short.

	♂ (mm.).	♀ (mm.).
Length of fore wing	40	43
,, ,, hind ,, ...	37	40
,, ,, body	?	36

W. Australia: Freemantle, 1879 (*Dr. Legge*), 1 ♂, 1 ♀.

Type ♂ in the Hope Department, University Museum, Oxford.

It was with some reluctance that I decided to describe these two examples on account of their faded and defective condition; in spite of the rather brief description the peculiarly pointed wings, particularly in the male, should render the species easy to recognize. It resembles *A. tillyardi* in the presence of a number of unicellular rows between Cu_{1a} and the posterior Banksian line, but in the present species the distance between the Banksian line and Cu_{1a} is greater.

Acanthaclisis fulvifusa, sp. n. (Pl. XIX. fig. *a*.)

♂. Head above fuscous, face yellowish, with sparse white hairs; antennæ dark fuscous, first segment and underside of some of the succeeding segments yellowish. Hairs at the base short and white. Palpi yellowish terminal segment of labial somewhat brownish. Pronotum narrowed anteriorly, about as wide as long, with sparse, long, blackish and grey hairs; ground-colour dull yellowish with five brown stripes. The median broad, with a fine pale line down the centre; on each side a narrow stripe in the anterior half of the prothorax and outside them a broader stripe running the length of the prothorax; posterior angles brown. Meso- and metathorax dull yellowish with brown markings, posteriorly with fine silky-grey hairs. Legs ferruginous, anteriorly particularly with silky-white hairs, anterior and median tibiæ banded with luteous, posterior almost entirely luteous; spurs curved, as long as the three basal tarsal segments. Tarsi blackish, first segment and base of fifth luteous. Abdomen brownish with two parallel, interrupted yellowish bands on the dorsum; eighth and apex of seventh tergite yellowish; appendages cylindrical, almost straight, dirty yellowish brown.

Wings hyaline, shaped as in Pl. XIX. fig. *a*, anterior suffused with brownish, leaving a number of oblique whitish streaks. Venation brownish except in the whitish streaks. Apices of both wings slightly falcate, posterior margin of anterior wing distinctly sinuous. Posterior Banksian line not very distinct. Intercubital area in anterior wing fairly wide, rarely bi-areolate, posterior branch of Cu_1 running almost straight to the margin. Stigma in both wings pale, without a dark spot basally. Marginal forks long and narrow.

♀. Resembling male, but larger, the yellowish abdominal markings more pronounced.

	♂ (mm.).	♀ (mm.).
Length of anterior wing	48	54
„ „ posterior „	43	48
„ „ body	44	42

QUEENSLAND: Bowen, Brisbane, Dawson, Rockhampton, Townsville, December to March.

Type ♂, Townsville, from the McLachlan collection (now in the British Museum), 1 paratype, 8 paratype ♀♀.

Five of the females are from the McLachlan collection, and bear determination labels in his hand-writing, "*Acanthaclisis conspurcata* Gerst." This is an error in determination, and *A. fulvifusa* may be distinguished from *conspurcata* by its yellowish colouring, sinuous margin to the anterior wing, brownish suffusion, and absence of a brown spot at the base of the stigma. Weele, when discussing *A. conspurcata* in 1908, mentions that he has a new species of *Acanthaclisis* which was received from McLachlan as *conspurcata*. Weele's species is probably identical with *fulvifusa*.

Key to the described Australian Species of Acanthaclisis.

1. M and Cu_{1a} in fore wing strongly curved backward shortly before reaching margin of wing	2.
M and Cu_{1a} almost straight near their apices	3.
2. Large species (fore wing 72 mm.........	*A. fulva* Esb.-P.*
Smaller species (fore wing 66·5 mm.) ...	*A. peterseni* Tillyd.*
3. Wings narrow, lanceolate; posterior margin of fore wing evenly curved to apex	4.
Wings broader; posterior margin of fore wing sinuous or angled near apex	5.
4. Apex of wings obtusely pointed; area between Cu_{1a} and Banksian line in fore wing narrow	*A. subtendens* (Walk.).
Apex of wings acutely pointed; area between Cu_{1a} and Banksian line wider.	*A. acuta* Kimmins.
5. An accessory longitudinal veinlet in radial area at base of hind wing	*A. fundata* (Walk.).
No such veinlet, but cross-veins in radial area sometimes angled...............	6.
6. Posterior margin of fore wing distinctly sinuous	*A. fulvifusa* Kimmins.
Posterior margin of fore wing not sinuous, but angled before apex	7.
7. Posterior Banksian line distinct	*A. tillyardi* Kimmins.
Posterior Banksian line indistinct	*A. conspurcata* Gerst.

EXPLANATION OF THE PLATES.

Plate XVIII.

Wings of:
a. Acanthaclisis subtendens Walker.
b. —— *acuta* Kimmins.
c. —— *fundata* Walker.

Plate XIX.

Wings of:
a. Acanthaclisis fulvifusa Kimmins.
b. —— *tillyardi* Kimmins.
c. —— *conspurcata* Gerstaecker.

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* Known to me from description and figure only.

LXVIII.—*Descriptions and Records of Bees.*—CLXXIV.

By T. D. A. Cockerell, University of Colorado.

All the bees recorded below belong to the British Museum.

Halictus tinctulus Cockerell.

Transvaal: Pretoria, Oct. 9–10, 1931, 2 ♀ (*J. Ogilvie*).

Halictus pallidipennis Smith.

S. Rhodesia: Beit Bridge, April 12, 1932 (*L. Ogilvie*).

I notice that this has the supraclypeal area smaller than in Naauwpoort specimens, but Ceres specimens agree with ours. The Beit Bridge form appears to agree with *H. heliophilus* Cam., but I cannot believe this to be a distinct species.

Halictus jessicus, sp. n.

♀.—Length about 5·5 mm., anterior wing 4 mm.

Black, with the mandibles obscurely reddish, the flagellum dusky red beneath, the very small tegulæ pale testaceous, the tibiæ and tarsi ferruginous, the tibiæ with a large dark patch about the middle; pubescence white, very thin on face and front, dense on upper part of cheeks, very scanty on thorax above, but forming a slender well-marked band along lateral and hind margins of mesonotum, and densely covering postscutellum; the fusiform abdomen has thin inconspicuous pale hair at sides of first tergite, a band of pale tomentum at base of third (but none on second), the surface of the third and following tergites thinly hairy, the sides of the apical segments with long pale hair, the extreme apex of the abdomen is red; head rather broad, the orbits converging below; clypeus little produced, shining, with strong punctures; supraclypeal area polished; front dull, a little shining at sides, but no polished band along orbits; mesonotum dullish, somewhat shining on disc, finely and closely punctured; scutellum shining, not bigibbous; area of metathorax very large, dull, the microscope shows very fine more or less wrinkled rugæ on basal half, minute tessellation on apical half. Wings clear hyaline, with extremely pale stigma and nervures, second cubital cell higher than broad, receiving recurrent nervure near end; outer recurrent and intercubitus evanescent. Legs with pale hair, on hind femora collecting much orange pollen; hind spur with a single lamella (style of *H. subvittatus*). Abdomen shining, the second tergite with a linear pale margin; hair of venter not very long.

S. Rhodesia: Jesse, April 13, 1932 (*J. Ogilvie*).

This has a general resemblance to *H. pallidipennis*, but lacks the basal band on second tergite, and is smaller, with a different hind spur, while the area of metathorax is relatively longer. The more robust *H. layardi* Ckll. is very similar, but has a quite different area of metathorax.

Halictus crassivenis, sp. n.

♀.—Length about 7 mm., anterior wing 5.

Black, robust, with very broad abdomen, but head not unusually broad, the orbits strongly converging below; mandibles with apical half dusky red; antennæ with the flagellum short and stout, very faintly brownish beneath; tegulæ black, finely punctured anteriorly; hair of head and thorax scanty, dull white, not dense on face or cheeks, not conspicuous on postscutellum; abdomen without bands, with thin pale hair at sides of first tergite, and pale hair at lateral bases of second and third; clypeus and supraclypeal area dull, the clypeus with sparse large punctures on a minutely lineolate surface, the supraclypeal area with minute punctures; a shining band along inner orbits; mesonotum dull, a little shining on disc, the small close punctures on a minutely tessellate surface; scutellum with two shining (but not polished) elevations, separated by a dull band; area of metathorax much longer than postscutellum, with numerous very fine wrinkled rugæ, appearing granular under a lens; posterior truncation sharply defined at sides. Wings greyish, darker apically, the stigma and very strong nervures black; first recurrent nervure joining third cubital cell some little distance from base. Legs black, outer side of hind tibiæ with some short black hair; hind spur with two or three stout spines (style of *H. megadelphus*). Abdomen polished, the hind margins of tergites black. There is much pollen on hind femora and underside of abdomen.

Belgian Congo (Katanga): Elisabethville, Sept. 11–17, 1931 (*J. Ogilvie*).

A distinct species, known by the broad black shining abdomen, very black nervures, and peculiar venation. Superficially, it is rather like *H. macrurops* Ckll., but that is considerably larger, with different wings and metathorax.

Halictus tanganus, sp. n.

♀.—Length about 6 mm., anterior wing 4.

Black, with the mandibles mainly red, flagellum very obscurely brownish beneath, tegulæ light reddish with pallid margins; legs black, the tarsi red at tip, the spurs whitish; hair of head and thorax thin, slightly reddish above; no dense hair on face or cheeks; postscutellum densely tomentose; hair on inner side of tarsi yellowish white; first tergite with a patch of dense tomentum at each side, second to fourth with entire basal bands of tomentum, apex of abdomen dark; head rather broad; clypeus shining, with strong punctures, showing a triangular flattened shining area; supraclypeal area dull, minutely sculptured, and with small punctures; a shining line along orbits; mesonotum dull, with minute dense punctures, a narrow line of hair along lateral margins; scutellum little shining, bigibbous; area of metathorax long, sharply margined posteriorly, with evident corners, the surface with irregular rugæ, nearly reaching apex in middle, but not at sides; posterior truncation well defined, shining but not polished. Wings greyish, stigma reddish brown, nervures pale brown, the outer intercubitus and recurrent weakened; first recurrent nervure meeting second intercubitus; hind spur with three short spines, which are flattened, so that in one view they appear stout, in another slender. Abdomen oval, the first tergite highly polished; venter with erect white hair.

Tanganyika Territory: Tanga, June 10, 1932 (*L. Ogilvie*).

Very like the S. African *H. interstitinervis* Cam., but that has black nervures and belongs to quite a different fauna.

Halictus puzeyi, sp. n.

♀.—Length about 6·5 mm., anterior wing 4·8.

Black, including antennæ and the small tegulæ, but mandibles reddened apically; legs black, the tarsi reddened apically; pubescence dull white; sides of face with long white hair; postscutellum not densely tomentose; the broad abdomen without hair-spots on the highly polished first tergite; second with patches of white hair at lateral bases, third with the patches larger and extended mesad, fourth with a basal band, thin in middle; head approximately circular seen from in front; clypeus not produced, moderately shining, striate-punctate; supraclypeal area dull; a shining band along inner orbits; mesothorax and scutellum polished, the latter binodose; area of metathorax very short, a transverse band, sharply defined posteriorly, about as large as postscutellum, its sculpture of fine wrinkled rugæ, readily seen under a lens. Wings clear hyaline, stigma and nervures dark brown, but outer recurrent and intercubitus colourless and evanescent; second cubital cell broad, first recurrent nervure meeting intercubitus, which is conspicuously oblique. Legs with pale hair, spurs dark reddish, hind spur with two or three stout spines (style of *H. megadelphus*). Abdomen polished, the hind margins of tergites not discoloured.

Natal: Merebank, Oct. 16, 1931 (*L. Ogilvie*).

Resembles *H. moffati* Ckll., but differs by the weak outer nervures, with outer side of third cubital cell bulging outward. It differs from *H. transvaalensis* Cam. by the dark brown (not red) stigma, but seems to be closely allied. Named after Mr. H. J. Puzey of Durban, in recognition of his work on the Mollusca of Natal.

Halictus tenuimarginatus Friese.

Orange Free State: North Bank Halt, Norval's Pont, April 12, ♂ (*J. Ogilvie*).

Halictus rufomarginatus Smith.

Cape Province: Doorn R., Nov. 3 (*J. Ogilvie, L. Ogilvie*); Bot River, Nov. 11 (*J. Ogilvie*); Ceres, Feb. (*J. Ogilvie*).

Halictus rhodaspis Cockerell.

Kirstenbosch, near Cape Town, 2 ♀, Nov. 18 (*L. Ogilvie, J. Ogilvie*).

Halictus deceptus Smith.

Cape Province: Bot River, Nov. 12 (*L. Ogilvie*).

Halictus pericinctus Cockerell.

Cape Province: Mafeking, Feb. 27–28, 1934 (*J. Ogilvie, L. Ogilvie*).

Halictus perpansus baralongus, subsp. n.

♀.—Length about 9·5 mm., anterior wing 6 (noticeably shorter than in *H. pericinctus*).

More slender than typical *H. perpansus*, with paler base of abdomen; no black mark on first tergite, black band on second tergite narrower; hind spur with a series of very short spines, hardly more than nodules (in *H. pericinctus* with about five very oblique spines of moderate length). This at first sight seems to be identical with *H. pericinctus*, found at the same place, but it is readily distinguished by the absence of a black band on first tergite, and the fourth tergite having an apical white tegumentary band. The area of metathorax is of the same general type in both; in *H. pericinctus* crescentic, with sharply-defined margin, the surface minutely tessellate, with very fine branching rugæ, resembling sea-weed. In *H. baralongus* the basal portion of the area has strong parallel rugæ, where the surface in *H. pericinctus* is reticulate. This insect is also related to *H. abessinicus* Friese. It may be compared with the species to which Cameron gave the preoccupied name *H. tricolor*. It is named after the Baralong tribe, resident at Mafeking.

Cape Province: Mafeking, Feb. 28 and March 1, 1934 (*J. Ogilvie*).

Halictus tenuihirtus, sp. n.

♀.—Length about 8·5 mm., anterior wing 6·4.

Black, the mandibles very faintly reddish apically, the flagellum very obscurely brownish beneath; tegulæ rather large, dark rufous, with prominent margin. Wings strongly dusky; stigma ferruginous, nervures brown, including the outer ones. Legs black, with the tarsi reddened apically; pubescence dull white, short and thin, on abdomen not forming any well-defined bands or spots, but there is thin hair on second to fourth tergites, tending to form ill-defined broad subapical bands; head rather broad; clypeus convex, shining, with strong well-separated punctures; supraclypeal area punctured, the lower part shining; sides of front broadly shining; a transverse groove behind ocelli; mesonotum highly polished, with scattered small punctures, notauli very distinct; scutellum polished, minutely punctured, with no dull median line; postscutellum without dense pale tomentum; area of metathorax rather large, conspicuously longer than postscutellum, slightly shining, with numerous strong rather wavy parallel plicæ, which do not reach the margin, the marginal area being minutely lineolate; marginal region of posterior truncation polished; second cubital cell broad, receiving recurrent nervure at its apical corner; third cubital rather long; hind spur with six oblique spines, the last two small. Abdomen robust, shining, the hind margins of tergites obscurely brownish, but not distinctly pallid; hair at apex pale; no ventral polliniferous scopa, but much reddish-orange pollen collected on hind femora.

Cape Province: Calvinia, Nov. 11–16, 1931 (*J. Ogilvie*, *A. Mackie*).

Three specimens. It is allied to *H. calviniensis* Ckll., but larger, with dusky wings, clypeus with no median depression, area of metathorax plicate, hind margins of tergites not whitish. It resembles *H. placatus* Ckll., but is easily spearated by the shorter face and polished mesonotum.

Halictus contracticaudus Cockerell.

Cape Province: Doorn River Falls, Nov., 4 ♂ (*J. Ogilvie*).

Halictus atopophlebus Cockerell.

Cape Province: Van Rhyn's Pass, 1 ♀ (*W. P. Cockerell*).

Halictus albosellatus, sp. n.

♂.—Length about 7·5 mm., anterior wing 6·2.

Black, with the mandibles reddened apically, flagellum dusky reddish beneath, tegulæ black, wings milky hyaline, stigma clear bright ferruginous, nervures pale brown, outer recurrent and intercubitus almost obsolete, legs black, small joints of tarsi reddened, broad apical plate of abdomen dark; pubescence white, abundant and erect on head and thorax, densely covering face and clypeus, long on cheeks; abdomen with a good deal of hair, but no well-defined bands, a large patch of dense white tomentum at middle of base of second tergite; tongue very short; clypeus prominent; flagellum long, reaching scutellum; mesonotum and scutellum moderately shining; mesonotum with numerous small punctures; scutellum with a median groove; area of metathorax dull and granular, as seen under lens, the microscope shows a reticulate surface, with shining pits, the hind margin of area angulate; second cubital cell nearly square, but somewhat higher than long, receiving recurrent nervure at apical corner. Abdomen shining, with much white hair at apex; venter with long white hair. The clypeus has no light band.

Cape Province: Doorn River Falls, Nov. 1931 (*J. Ogilvie*).

Belongs to the group with a saddle-like patch of tomentum on second tergite, and falls next to *H. percornutus* Ckll., from Natal, which has a dark brown stigma and differs in other respects. A second specimen, with the same data, has the patch on second tergite appearing greyish and the flagellum bright red beneath. I thought it a distinct species, but it appears to be only a variation.

Halictus pallidicinctulus, sp. n.

♀.—Length about 8·5 mm., anterior wing 6.

Black, robust, mandibles rufescent at apex, flagellum dusky reddish beneath; tegulæ large, with expanded hyaline margins, anteriorly there is a black patch, and posteriorly a large fulvous elevation. Wings rather dusky hyaline, slightly yellowish; stigma dusky red, nervures brown, outer nervures distinct. Legs black. Abdomen with hind margins of tergites pallid testaceous, over which are white hair-bands, well developed on third and fourth, on first and second only at sides; pubescence dull whitish; head very broad (much broader than in *H. pastinus* Ckll.), the facial quadrangle broader than long; clypeus and supraclypeal area shining, with irregular punctures, the disc of clypeus flattened; sides of front broadly shining; mesothorax shining, but with many small punctures; scutellum large, polished, with minute punctures, dense in middle line; postscutellum not densely tomentose; area of metathorax dull, very large, with a shining posterior margin, dull in middle; the microscope shows the area to have very delicate parallel plicæ, modified to a very fine network in middle, and not reaching margin; second cubital cell very broad below (the second intercubitus oblique), receiving the recurrent nervure a short distance before the end; hind spur minutely serrulate, not dentate; abdomen shining, the hair at apex reddish brown.

Cape Province: Nieuwoudtville, Nov. 18–22, 1931, 3 ♀ (*J. Ogilvie*).

This may be compared with the following species:—

	Hind spur without spines or teeth	1.
	Hind spur with well-developed spines	3.
1.	Hind margin of first tergite broadly red	*serriferus* Ckll.
	Hind margin of first tergite not red	2.
2.	First tergite dull, with black margin	*acaciæ* Ckll.
	First tergite polished, with testaceous margin.	
3.	Hind spur with about seven spines; flagellum reddened beneath apically	*malachurinus* Ckll.
	Hind spur with four spines; flagellum darker; third cubital cell more produced apically	*malachurinus levisculptus* Ckll.

On renewed study, I conclude that *H. levisculptus* is no more than a race of *H. malachurinus*.

H. calviniensis Ckll. approaches *H. pallidicinctulus*, but is smaller, with a different head and quite a different spur.

Halictus latior, sp. n.

♀.—Length 9 mm., anterior wing 7.

Black, robust, with very broad abdomen, which is almost without bands or spots, though there is thin pale tomentum (only seen in lateral view) on lateral bases of second and third tergites; mandibles and antennæ black; tegulæ rufous, with a black stain in front, and expanded hyaline margins. Wings brownish, stigma dusky red, nervures brown, outer recurrent and intercubitus weak, second cubital cell very broad, first recurrent nervure meeting intercubitus. Legs black, with light red hair on inner side of tarsi; hair of head and thorax white at sides and beneath, dull whitish on thorax above, but distinctly reddish on upper part of head; head broad; clypeus short, the upper part flattened and closely punctured, the lower part shining, with sparse large punctures, the lower corners with prominent teeth (as in *H. bidens* Cam.); supraclypeal area dullish, finely punctured; sides of front broadly glistening; mesonotum shining but not polished, with minute dense punctures, scutellum similarly sculptured, with a median groove; postscutellum anteriorly with grey tomentum; area of metathorax short (hardly as long as postscutellum), sharply bounded behind, its surface densely covered with coarse wrinkled rugæ, but with no longitudinal plicæ; hind femora arched or bent; hind spur with seven oblique, not very long, spines, the apical ones minute (style of *H. deceptus* Smith and *H. matoporum* Ckll.). Abdomen shining; second to fourth tergites with the apical margin very narrowly pallid; caudal rima fringed with reddish hair; venter with long white hair.

Cape Province: Doorn River, near Camfer, Nov. 3, 1931 (*Alice Mackie*).

By the broad abdomen this resembles *H. sulciferus* Ckll., which has a polished disc of mesonotum and basal bands on tergites; and *H. lactescens* Ckll., which has black tegulæ and polished mesonotum. It differs from *H. deceptus* Smith by the red tegulæ and lack of hair-bands at bases of tergites.

The following table is based entirely on holotypes, all of which will be placed in the British Museum:—

	First tergite of abdomen light yellowish red.	*perpansus baralongus* [Ckll.
	First tergite black	1.
1.	Males	2.
	Females	4.
2.	Clypeus with tegument all black; wings milky hyaline; second tergite with a patch of white or greyish tomentum at middle of base	*albosellatus* Ckll.
	Clypeus with a light apical band; second tergite without such a patch	3.
3.	Very small species, with large area of metathorax	*parvulinus* Ckll.
	Much larger species (about 8 mm. long), with shorter area of metathorax; flagellum very bright red beneath	*contracticaudus* Ckll.
4.	Small species (about 5·5 mm. long), with a light band along hind margin and sides of mesonotum; hind tibiæ and tarsi red .	*jessicus* Ckll.
	Larger, with no such band bordering mesonotum	5.
5.	Third tergite with two distinct hair-bands .	6.
	Third tergite without two bands	8.
6.	Disc of mesonotum polished	*leucophenax* Ckll.
	Disc of mesonotum dull, or not polished; tegulæ red	7.

7.	Larger; hind tibiæ entirely red; mesonotum a little shining	*trichardti* Ckll.
	Smaller; hind tibiæ red at apex; mesonotum entirely dull	*acaciæ* Ckll.
8.	Second tergite with a well-defined entire basal band; first tergite highly polished, with a patch of light tomentum at each side	*tanganus* Ckll.
	Second tergite without such a band	9.
9.	Depressed apical margins of tergites pallid, with hair-bands; no trace of basal bands	10.
	Abdomen otherwise; hind tibiæ and tarsi black	11.
10.	Hair of thorax above red; abdominal hair-bands with a yellowish tint	*levisculptus* Ckll.
	Hair of thorax above white; abdominal hair-bands pure white	*pallidicinctulus* Ckll.
11.	Mesonotum dull; wing-veins very black and strong, including outer intercubitus and recurrent; rather small species	*crassivenis* Ckll.
	Mesonotum shiny, or polished, if dullish (*latior*) a much larger species	12.
12.	Mesonotum very coarsely punctured; tegulæ black	*atopophlebus* Ckll.
	(Rather coarsely punctured; tegulæ red	*tenuihirtus*.)
	Mesonotum finely punctured	13.
13.	Second and third tergites without patches of white tomentum at lateral bases; wings dusky	14.
	Conspicuous patches of white hair at lateral bases of second and third tergites	15.
14.	Mesonotum highly polished, with very distinct punctures	*tenuihirtus* Ckll.
	Mesonotum dullish, with very minute punctures; abdomen very broad	*latior* Ckll.
15.	Area of metathorax rather large, appearing dull and granular under a lens; tegulæ black	*mirifrons* Ckll.
	Area of metathorax short and band-like, with distinct sculpture	16.
16.	Larger; third tergite with two pure white basal patches, separated by a distance greater than the length of one	*lactescens* Ckll.
	Smaller; third tergite with an interrupted white basal band, fourth with an entire band	*puzeyi* Ckll.

Halictus jucundus komensis, subsp. n.

♀.—Length about 9 mm., anterior wing 6.

Area of metathorax conspicuously shorter, with strong plicæ; at sides the narrowed area is sharply bounded behind by the greatly thickened margin, which is interrupted by a deep sulcus in middle. Head smaller than in S. African *H. jucundus*; colours of insect more brassy; flagellum obscurely red beneath; thorax small; tegulæ dusky reddish; wings hyaline, faintly yellowish; stigma and nervures very pale, the stigma relatively small and narrow.

East end of Kome Island, N.W. Victoria Nyanza, Jan. 12. 1919 (*G. D. H. Carpenter*). Prey of Asilid fly marked A. Additional material, of both sexes, may show this to be a distinct species.

LXIX.—*The Ectoparasites of Australian Birds and Mammals.*—II. *Notes on the Mallophaga parasitic on Australian Marsupials.* By GORDON B. THOMPSON.

SINCE the publication of a paper by Harrison and Johnston (1916) only a single paper dealing with the Australian Marsupial Mallophaga has been published. With the hope of stimulating interest in a field of parasitology which has been little explored, I am presenting the following notes. It is to be hoped that a study of the Mallophagan parasites of these interesting mammals may ultimately throw some light on the interrelations of their hosts.

I should like to take this opportunity of pointing out that it is most essential that these parasites be studied when comparatively fresh, as I have experienced considerable difficulty in making adequate preparations of specimens which have been preserved for long periods. Specimens from a single host specimen should be placed together in a single tube of alcohol (70–80 per cent.) with a label bearing the following data:—Name of host, common and scientific [it is essential that the name of the host be correctly stated, otherwise the specimens are of little value], locality, date, position of parasites on hosts (if collected immediately after death), and collector's name.

As I am in the very fortunate position of having in my care typical or co-typical specimens of a large number of the species described to date, I shall be pleased to receive material for study.

Iredale and Troughton (1934), in their catalogue of the Australian Mammals, list fifty-five genera of Marsupials, of these fifty-five genera only eleven genera contain the type-hosts from which Mallophaga have been described. The seven genera of Mallophaga containing the known species of Marsupial parasites are, with the exception of two, "*Heterodoxus longitarsus* (Piaget)," recorded from dogs, and *Boopia peregrina* Mjöberg, described from an Otter from India (see below), confined exclusively to the Australian Marsupials. The following table will serve to explain the distribution of the parasites on the various host genera :—

Genera of Marsupialia.	Genera of Mallophaga.						
	Boopia.	*Dendrolagia.*	*Heterodoxus.*	*Latumcephalum.*	*Macrophila.*	*Paraheterodoxus.*	*Phacogalia.*
Antechinus	—	—	—	—	—	—	×
Dasyurops	×	—	—	—	—	—	—
Perameles	×	—	—	—	—	—	—
Vombatus	×	—	—	—	—	—	—
Æpyprymnus ...	×	—	—	—	—	×	—
Dendrolagus	—	×	—	—	—	—	—
Thylogale	—	—	×	—	×	—	—
Wallabia	×	—	×	×	—	—	—
Osphranter	—	—	×	—	—	—	—
Megaleia	×	—	×	—	—	—	—
Macropus	×	—	×	—	—	—	—

CATALOGUE OF THE VALID SPECIES OF MALLOPHAGA.

Family **Boopidæ** Mjöberg.

Subfamily *BOOPINÆ* Harrison & Johnston.

1. Genus BOOPIA Piaget.

1. *bettongia* Le Souëf, Vict. Nat. xix. 1902, p. 50, f. 2.

Type-host.—*Æpyprymnus rufescens* Gray. (*Bettongia rufescens.*)

2. *grandis* Piaget, Les Pédiculines, Suppl. 1885, p. 154, pl. xvi. f. 8.

Type-host.—*Megaleia rufa* Desmarest. (*Macropus rufus.*)

3. *minuta* Le Souëf, Vict. Nat. xix. 1902, p. 51, f. 3.

Type-host.—*Wallabia dorsalis* Gray. (*Macropus dorsalis.*)

4. *notafusca* Le Souëf, Vict. Nat. xix. 1902, p. 50, f. 1.

Type-host.—*Wallabia bicolor* Desmarest. (*Macropus ualabatus.*)

5. *phanerocerata* Harrison & Johnston, Parasitology, viii. 1915, p. 348, f. 7.

Type-host.—*Perameles nasuta* Geoffroy.

6. *spinosa* Harrison & Johnston, Parasitology, viii. 1915, p. 350, f. 9.

Type-host.—*Wallabia bicolor* Desmarest.

7. *tarsata* Piaget, Les Pédiculines, 1880, p. 599, pl. l. f. 1.

Type-host.—*Vombatus ursinus* Shaw. (*Phascolomys fossor.*)

8. *uncinata* Harrison & Johnston, Parasitology, viii. 1915, p. 349, f. 8.

Type-host.—*Dasyurus quoll* Zimmerman.

2. Genus HETERODOXUS Le Souëf & Bullen.

1. *longitarsus* Piaget, Les Pédiculines, 1880, p. 504, pl. xli. f. 7.

Type-host.—*Macropus* ? *major* Shaw. (*Halmaturus giganteus.*) *

3. Genus PHACOGALIA Mjöberg.

1. *brevispinosus* Harrison & Johnston, Parasitology, viii. 1915, p. 355, f. 12.

Type-host.—*Antechinus flavipes* Waterhouse. (*Phascogale flavipes.*)

4. Genus PARAHETERODOXUS Harrison & Johnston.

1. *insignis* Harrison & Johnston, Parasitology, viii. 1915, p. 357, ff. 13, 14.

Type-host.—*Æpyprymnus rufescens* Gray.

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* It is extremely difficult to understand what is meant by "*Halmaturus giganteus*" of the older writers.

5. Genus DENDROLAGIA Mjöberg.

1. *pygidialis* Mjöberg, Ent. Tidskr. 1919, p. 94.

Type-host.—*Dendrolagus lumholtzi* Collett.

6. Genus MACROPOPHILA Mjöberg.

1. *forcipata* Mjöberg, Ent. Tidskr. 1919, p. 95.

Type-host.—*Thylogale coxeni* Gray.

Subfamily *LATUMCEPHALINÆ* Harrison & Johnston.

7. Genus LATUMCEPHALUM Le Souëf.

1. *lesouëfi* Harrison & Johnston, Parasitology, viii. 1915, p. 343, ff. 2, 3.

Type-host.—*Wallabia ursinus* Shaw.

2. *macropus* Le Souëf, Vict. Nat. xix. 1902, p. 51, f. 4.

Type-host.—*Wallabia dorsalis* Gray.

From the above list I have omitted the synonyms of *H. longitarsus* (Piaget), including those which have been described from dogs, and *B. peregrina* Mjöberg, which was said to have been taken from a specimen of *Lutra pruneri* from India "just freshly arrived" in the Zoological Gardens, Hamburg. With regard to the synonyms of *H. longitarsus* (Piaget), I am at present engaged in writing a paper, in collaboration with a colleague, on the species occurring on dogs, etc., and it is to be hoped that everything will then be explained. *B. peregrina* Mjöberg is, I feel sure, a straggler from a Marsupial, in spite of Mjöberg's statement, and as far as I have been able to tell it will eventually prove to be the same as one of the previously described larger species of *Boopia*.

Key to the Subfamilies and Genera.

	Palpi two-segmented	LATUMCEPHALINÆ.
	Palpi four-segmented	BOOPINÆ.
1.	Species with dagger-like spines beneath the head	2.
	Species without dagger-like spines beneath the head	*Boopia.*
2.	Spines stout	3.
	Spines small	*Macrophila.*
3.	Spines rising from base of palpi	*Heterodoxus.*
	Spines not rising from base of palpi	4.

4. Spines rising immediately behind the base of the palpi	*Dendrolagia.*
Spines rising still more posteriorly	5.
5. Spines rising from chitinous framework which supports the palpi at a level of the eyes ...	*Phacogalia.*
Spines rising from posterior margin of gular plate, *i. e.* posterior to level of eyes	*Paraheterodoxus.*

LOCATION OF THE TYPES OF THE SPECIES OF MARSUPIAL MALLOPHAGA.

Up to the present, I have succeeded in tracing the types of all the species described to date except *Boopia minuta* Le Souëf and *B. bettongia* Le Souëf. It is probable that these are lost. Le Souëf and Bullen did not designate any specimens as types, and in the cases where specimens of the species described by them are at present contained in the collection in my care I take this opportunity of designating type-specimens. The types of Mjöberg's two species, namely *Dendrolagia pygidialis* and *Macropophila forcipata*, are, as far as I have been able to ascertain, contained in Mjöberg's collection. Piaget's types are in the collection of the British Museum (Natural History). The following is a list of the type material contained in the collection in my care :—

Boopia phanerocerata Harrison & Johnston.

♂♀ types, 4 ♀♀, 1 ♂, paratypes off *Perameles nasuta* Geoffroy, New South Wales, Sydney, vi. 1911 (*L. Harrison*).

Boopia notafusca Le Souëf.

♂♀ types off *Wallabia bicolor* Desmarest, Australia, Victoria, 1902 (*A. S. Le Souëf*).

Boopia uncinata Harrison & Johnston.

♀ type, 1 imm. off *Dasyurus quoll* Zimmermann, N.S. Wales, Sydney, 7. vii. 1910.

Boopia spinosa Harrison & Johnston.

♀♂ types off *Wallabia bicolor* Desmarest, Victoria (*A. S. Le Souëf*).

Paraheterodoxus insignis Harrison & Johnston.

♀ type off *Æpyprymnus rufescens* Gray, N.S. Wales, Sydney Zoo (*L. Harrison*).

Phascogalia brevispinosus (Harrison & Johnston).

♀ type off *Antechinus flavipes* Waterhouse, N.S. Wales, Sydney Zoo, viii. 1911 (*A. S. Le Souëf*).

Latumcephalum macropus Le Souëf.

♀♂ types, 2 ♀♀ paratypes off *Wallabia dorsalis* Gray, Victoria, 1902 (*A. S. Le Souëf*).

Latumcephalum lesouëfi Harrison & Johnston (=*L. macropus* Le Souëf).

♂ type and 2 imm. off *Wallabia bicolor* Desmarest, Victoria, 1902 (*A. S. Le Souëf*).

[*Boopia peregrina* Mjöberg.

2 ♀♀ paratypes off *Lutra pruneri*, India.]

The above material was in a terrible condition in its original state, but I have since remounted and labelled it all.

REPORT ON SPECIMENS CONTAINED IN THE WEST AUSTRALIAN MUSEUM.

Through the kindness of Mr. P. Glauert, Director of the West Australian Museum, I have had the opportunity of studying a small collection of Mallophaga from Australian Marsupials. My notes on this collection are given below.

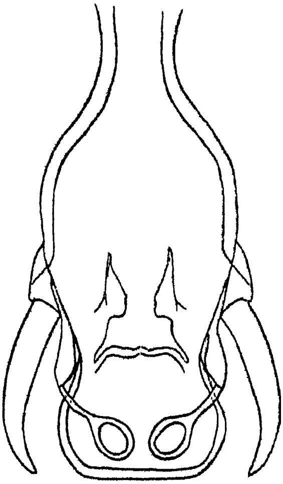
1. *Boopia uncinata* Harrison & Johnston.

A very large series of males and females collected from *Dasyurinus geoffroyi* Gould, S.W. Australia, Forest Grove, 1906, and same host species, W. Australia, Serpentine, which seem to be referable to this species. The male has not yet been described, so I take this opportunity of figuring the male genitalia and giving a few notes.

The male differs from the female in its generally smaller measurements and in having the terminal abdominal segment simple and bearing four setæ. The genitalia (see figure, p. 608) is of the same general type as *B. phanero-*

cerata Harrison & Johnston. The parameres seem to be somewhat stouter and more curved. A sac is present, but this is not shown in the figure.

Measurements of Male.—Length 1·6 mm.; greatest breadth 0·7 mm.



♂ genitalia of *Boopia uncinata* Harrison & Johnston.

2. *Heterodoxus* ?, sp. n.

Two females collected from *Bettongia lesueur graii* Gould, W. Australia (31–447/50).

3. *Heterodoxus* ?, sp. n.

Two males and two females collected from *Bettongia penicillata* Gray, W. Australia, Margaret River District (6011).

For the present it is only possible to state that the two records given above are of species of the genus *Heterodoxus*, which are, in all probability, undescribed. When the paper referred to previously concerning the "*Heterodoxus longitarsus* (Piaget)" group has been concluded and published it is to be hoped that these specimens will be determinable to species.

LXX.—*The Larvæ of the Decapod Genus* Naushonia.

By Robert Gurney and M. V. Lebour (Naturalist at the Plymouth Laboratory).

The genus *Naushonia* has, until recently, been represented by one species, *N. crangonoides*, Kingsley, of which two adult specimens only have been taken near Woods Hole.

Dr. Chace has now discovered that the genus *Homoriscus* Rathbun, with two species *H. portoricensis* Rathb. and *H. macginitei* Glassell, is synonymous with *Naushonia*, and proposes also to include *Coralliocrangon perrieri*, in the genus. If Nobili's statement of the gill-formula of *Coralliocrangon* is correct such a conclusion seems impossible, but the agreement in other respects is so close that it must be supposed that Nobili was mistaken. Chace has discussed the systematic position of the genus, which was correctly referred by Thompson (1903) to the Laomediidæ, and considers that it requires to be placed in a new subfamily Naushoniinæ.

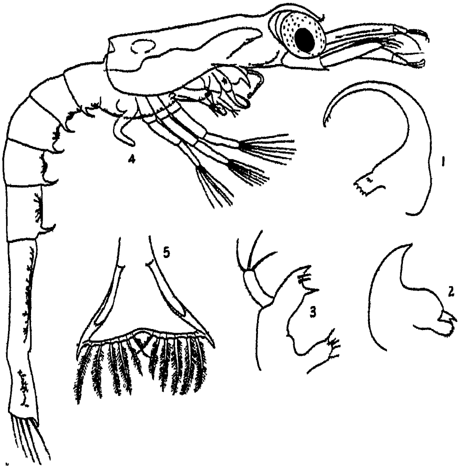
The larva of *N. crangonoides* was described by Thompson, who pointed out its close resemblance to the larva of *Jaxea*.

A larva from Samoa and the Great Barrier Reef has been described (Gurney, 1938) which has the essential characters of *Naushonia*, but it is quite distinct from *N. crangonoides*. If Chace is right in referring *Coralliocrangon* to this genus it may well be that this form belongs to *N. perrieri*.

During our stay in Bermuda in 1938 some larvæ of *Naushonia* were taken which very much resemble those of *N. crangonoides*, but they differ sufficiently from Thompson's description to make it certain that they do not belong to that species. One of these larvæ moulted to post-larval on July 1. Two more moults were obtained on Aug. 31 and Sept. 1, and this last specimen moulted again to post-larval Stage II. on Sept. 6. All these larvæ were taken in plankton outside Castle Harbour between June and September, but one specimen in Stage I. was found in a night haul in the Reach on Sept. 1, so that the adult probably lives in shallow water. No larvæ have been seen from Sept. 1 to end of January.

Even at the second post-larval stage the adult characters are so little developed that it is impossible to be certain of the identification, but it is very probable that these are the larvæ of *N.* (*Homoriscus*) *portoricensis*. This provisional identification is supported by the form of the antennal scale, which has five outer teeth in the first post-larval stage, and by the presence of a pair of small lateral teeth on the telson.

We are much obliged to Dr. Chace for letting us see the manuscript of his paper, to which this may be regarded as supplementary.



Naushonia portoricensis ?

Fig. 1.—Stage I, left mandible.
Fig. 2.—Ditto, right mandible.
Fig. 3.—Ditto, maxillule.
Fig. 4.—Stage II.
Fig. 5.—Ditto, telson.

Stage I.—Length 1·7 mm.

Rostrum small, upturned at end. Abdominal somites with small procurved pleural points. Telson triangular, with posterior margin deeply indented in middle and bearing five feathered setæ; outer angle pointed, this spinous process representing spine 1 of the 7+7 series; spine 2 reduced to a hair.

Antennule unsegmented, without endopod. Antennal scale with 10 setæ and without spine; endopod with three long setæ. Mandibles asymmetrical, the left one sickle-shaped. Paragnath on left side transformed into a slender sickle. Maxillule with the two laciniæ small and very widely separated; endopod small, unsegmented. Maxilla with three inner lobes; endopod minute; exopod small without proximal extension. Maxillipedes 1 and 2, basis long and slender; exopods with four apical setæ; endopods of four segments, without outer setæ. Maxillipede 3 a uniramous rudiment.

Colour.—General appearance brownish orange. There is a general clear dark yellow ground-colour, with red chromatophores, as shown in fig. 4.

Stage II.—Length 2·5 mm.

General form as in Stage I., and mouth parts the same, but posterior margins of telson straighter and less indented.

Antennule with minute rudiment of endopod. Antennal scale with 11 setæ; endopod the same. Maxillipede 3 with exopod, but endopod rudimentary. Exopods with six setæ. Leg 1 a large rudiment, with minute bud for endopod. Telson with 8+8 setæ.

Stages III. and IV. were not found, but we have several specimens of the last stage, from one of which the post-larva was obtained. This is, we believe, Stage V., and its size is what one would expect at Stage V. if growth takes place according to the usual growth factor of about 1·26.

Stage V.—Length 5 mm.

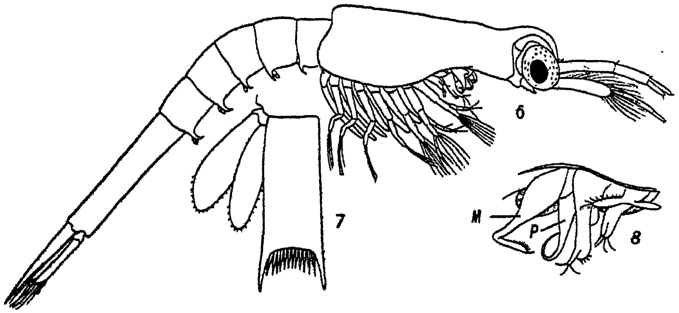
Telson parallel-sided or slightly widened at end, the length more than twice the width, with very large spine at each angle and 12 spines on the hollowed posterior margin. On the outer side of the spine there may be two minute spinules or serrations, but the spine formula may be said to be still 8+8.

Antennule with endopod and exopod unsegmented, the former a little the longer. Antenna, scale without spine; endopod segmented, about twice length of scale. Mouth-parts little changed.

All legs are now present, the endopods large, springing low down from the basis, and unsegmented; exopods present on legs 1–4.

Pleopods very small, on somites 2–5.

This form differs from *N. crangonoides* in being very much smaller. According to Thompson the latter is 4 mm. at Stage II. and 9·3–10 mm. in Stage V. In *N. crangonoides* there is no pleural spine on somite 1, and the telson is of somewhat different shape throughout. Thompson's figure of the last stage also shows leg 1 with a large swollen endopod reaching forwards to the mouth.



Naushonia portoricensis ?

Fig. 6.—Stage V ?
Fig. 7.—Ditto, telson and uropods.
Fig. 8.—Ditto, mouth-parts, left side. *M*, mandible ; *P*, paragnath.

Post-larval I.—Length 3·2 mm.

Carapace with faintly marked linea thalassinica ; rostrum triangular, with broad base and small apical point, and two very small teeth on outer margins. Eye large, with small knob on anterior inner side as in some Penæids.

Telson about twice as long as wide, rounded at end and fringed with long setæ ; one pair of very small lateral teeth.

Scale of antenna with five outer teeth and inner margin setose *. Mandible palp curved, indistinctly segmented. Maxilla with four large inner lobes ; exopod large, its proximal extension almost without setæ. Maxillipede 1, exopod straight, widened at base and with six outer setæ ; endopod of three segments, not widened at end, and without setæ ; epipod large ; no arthrobranch seen.

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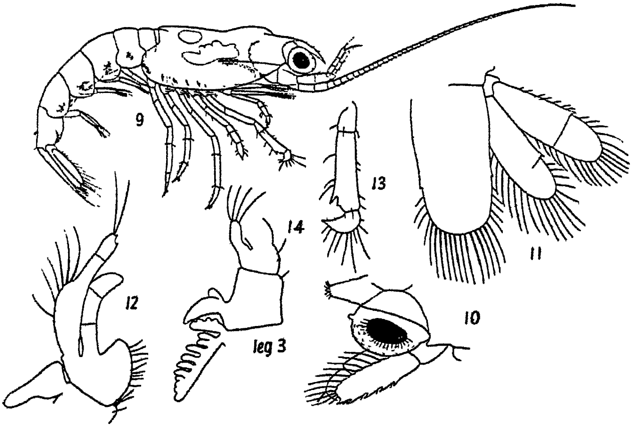
* In *Jaxea nocturna* the first post-larval stage has a scale with teeth on its outer margin (Caroli, 1924).

Maxillipedes 2 and 3, exopod straight; ischium of maxillipede 3 not serrated. Leg 1 slender, not reaching beyond eye; propod $3\frac{1}{2}$ times as long as wide, with one large tooth and a very small one between it and the dactyl; dactyl broad, recurved. Legs 1–4 with vestigial exopods, each bearing four apical setæ. Legs 2 and 4 shorter than the rest. Dactyls simple. Maxillipede 3 and legs 1–4 each with setobranch bearing two setæ, and each with epipod and two arthrobranchs. Uropods large, with suture on both branches.



Naushonia portoricensis ?

Fig. 9.—Post-larval I.
Fig. 10.—Ditto, dorsal view of rostrum and antenna.
Fig. 11.—Ditto, telson and uropod.
Fig. 12.—Ditto, maxillipede 1.
Fig. 13.—Ditto, part of leg 1.
Fig. 14.—Ditto, part of leg 3 showing exopod and gills.

Colour.—Colourless dorsally. Yellow in antennæ, along thorax and abdomen ventrally, and in somite 6 and telson. Small red spots at bases of legs.

Post-larval II.—Length 3·25 mm.

Linea thalassinica and cardiac groove distinct. Rostrum unchanged.

Antennal scale with three outer teeth only.

Mandible palp curved, with three segments. Maxillule, laciniæ broad; endopod with end bent back. Proximal extension of exopod of maxilla with five long setæ at end. Maxillipede 1, endopod of two segments, dilated at end. Exopods of maxillipedes with lash bent nearly at right angles to stem. Maxillipede 3 with ischiomerus strongly serrated. Leg 1, propod a little wider, but with only one large inner tooth. Leg 2, dactyl broad, inner margin with small teeth and outer thickly setose.

There is a small arthrobranch on maxillipede 1. Maxillipede 2 has a large podobranch, but there are as yet only rudiments of the podobranchs on the legs.

Colour.—Almost colourless; the yellow ground-colour largely lost, and the red chromatophores very contracted.

LITERATURE.

CAROLI, E. 1924. " Sviluppo larvale e primo studio post-larvale della *Jaxea nocturna* Nardo (=*Calliaxis adriatica* Heller)." Pubb. Staz. Zool. Nap. v. pp. 153–197.

CHACE, F. A. 1939. " On the Systematic Status of the Crustacean Genera *Naushonia, Homoriscus,* and *Coralliocrangon.*" Ann. & Mag. Nat. Hist. ser. 11, vol. iii. p. 524.

GURNEY, R. 1938. " Larvæ of Decapod Crustacea.—V. Nephropsidea and Thalassinidea." Discovery Rep. xvii. pp. 291–344.

THOMPSON, M. T. 1903. "A rare Thalassinid and its Larva." Proc. Bost. Soc. N. H. xxxi. no. 1.

LXXI.—*A new* Tettigonia *from the Russian Far East (Orthoptera).* By B. P. UVAROV, D.Sc., British Museum (Natural History).

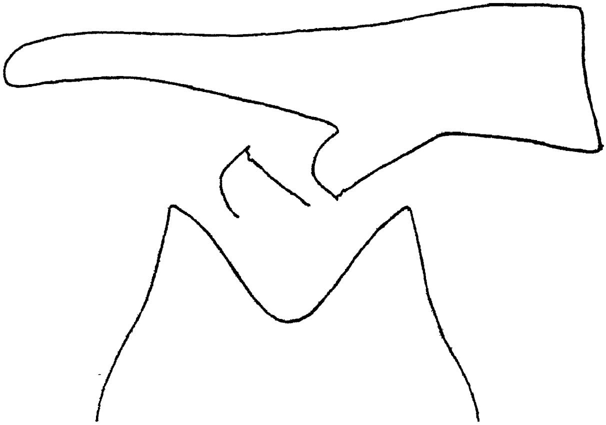
A SMALL collection of Orthoptera from the Russian Far East, received by me some years ago from Dr. V. M. Engelhardt, included a specimen of *Tettigonia* which I did not include into my report on the collection published at the time (see Ann. & Mag. Nat. Hist. ser. 9, xvii. 1926, p. 273), as I could not be certain of its identity and hoped to obtain more material. The appearance of a recent paper by Furukawa (Zool. Mag., Tokyo, vol. l. 1938, p. 446) on the subspecies of *Tettigonia orientalis* Uvarov, in Japan, induced me to re-examine the continental specimen mentioned above, which I thought may belong to the Japanese species. Actually, it proved to be so distinct from it, and from other known species, that I do not hesitate describing it as new, although there is only a single male at my disposal.

Tettigonia ussuriana, sp. n. (See figure.)

♂.—Similar in general appearance to *T. cantans* (Fuessly), but somewhat larger.

Fastigium of vertex truncate in front, flattened and distinctly sulcate above.

Pronotum somewhat saddle-shaped, with the metazona weakly ascending and practically flat; surface of prozona smooth, that of metazona distinctly and densely punctured; posterior margin of metazona weakly bilobate. Prosternal spines long, slender. Mesosternal lobes long, with the apical half attenuate.



Tettigonia ussuriana, sp. n., ♂.
Left cercus; tooth of the right cercus; apical abdominal tergite.

Elytra reaching just beyond hind knees, broad basally and strongly attenuate apically; radial vein branched in the middle. Wings short, and broadly rounded.

Front and middle femora with a few black spinules on both lower carinæ, those on the posterior carinæ being less numerous. Hind femora relatively short and weak; lower outer carina with about eighteen small black spinules; lower inner with twelve spinules.

Last abdominal tergite with a moderately deep but broad excision; its lobes triangular, broad. Cercus long, practically straight; its tooth placed shortly before the middle, short, globular, bearing two small teeth under the short pointed apex; basal part of cercus somewhat constricted.

Coloration light yellowish brown (probably discoloured).

Described from a male from the river Lian-chi-khe, Maritime province, 22. ix. 1926 (*Engelhardt*). The type in the Zoological Institute, U.S.S.R. Academy of Sciences, Leningrad.

The measurements of the new species are presented in the following table, parallel with those for two allied species:—

	cantans.	*ussuriana.*	*orientalis.*
Body length	26	29	31
Pronotum	7·5	8	9
Hind femur	20	22·5	27
Elytron, length	26	31	33·5
Elytron, maximum width.	9	11	11

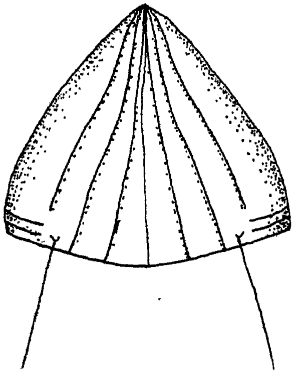
It can be seen from the table that *T. ussuriana* occupies in most measurements an intermediate position between *T. cantans* and *T. orientalis*, but it definitely approaches *T. cantans* in having relatively short hind femur. Another point of resemblance between the two is the puncturation of the pronotal metazona, which in *T. orientalis* is smooth. On the other hand, the shape of the male elytron, which is strongly narrowed to the parabolic apex, is very similar in *T. ussuriana* and *T. orientalis*, while in *T. cantans* the elytron is weakly narrowed, and its apex considerably broader. This shape of the elytron is reflected in the position of the branching of radial vein, which is beyond the middle in *T. cantans* and in the middle in the other two species. The shape of the apical abdominal tergite is similar in *T. cantans* and *T. ussuriana*, but the cercus of the latter, with its denticulate tooth, is highly peculiar, and leaves no doubt as to specific independence of *T. ussuriana*.

LXXII.—*A Species of Gall-mite* (Eriophyidæ) *injurious to Tomato.*

By A. M. Massee, D.Sc. (Research Station, East Malling, Kent, England).

A SPECIES of gall-mite which produces whitish pilose areas on the stems and young fruitlets of the tomato plant was sent to East Malling in May, 1938, by Monsieur P. Regnier, Chief of the Plant Protection Service, Rabat, Morocco.

The nature of the damage caused by the mite proves to be somewhat similar to that produced by another species, namely *Phyllocoptes lycopersici* Massee, which was described recently from material received from Australia and New Zealand *.



♀. Dorsal view of cephalothoracic shield of *Eriophyes lycopersici*, sp. n. × 860.

The species from Morocco is quite distinct, however, and proves to be an undescribed species of the genus *Eriophyes*.

It is proposed to name this new species *Eriophyes lycopersici*.

The mites feed on the stems and other aerial parts of the plant, producing a number of whitish markings at the affected parts. These whitish areas are the direct result of the irritation caused by the mites, which produce an abnormal hairiness of the upper surface. These hairy areas are usually found on the stems and leaf-stalks, but may occur on any part of the plant. They vary in length from a few centimetres to the whole length of the stem. When the very young growth is attacked, it exhibits a slightly cottony appearance, which is frequently of a bluish colour, and the growth is materally retarded. The mite also attacks the young green fruitlets and the fruit-stalks, producing little patches of abnormal hairs.

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* Massee, A. M. "An Eriophyid Mite injurious to Tomato." Bull. Ent. Res. 1937, xxviii. p. 403.

When the infestation is very severe the whole plant becomes very stunted, it is covered with abnormal hairs, and little or no crop is produced.

The mite is considered to be an important economic species, but since its presence is too often not noticed until much of the damage has been caused to the plant, it is too late to save the crop. In certain circumstances the infestation becomes very severe towards the end of the harvest; this may be explained by the fact that the plants are not attended to so carefully as they are in their young stages of growth.

Reports of damage by the mite have been received by the authorities from all the tomato-growing districts of Morocco, including an area of some hundred-and-twenty miles or more along the sea-coast.

With regard to control measures, regular dustings of sulphur are said to check the spread of the mite, but the treatment must be a matter of routine to be effective.

An undescribed species of gall mite was recognised as being the cause of the trouble over seven years ago, but the symptoms of the damage caused by it was familiar to tomato growers many years before that time.

The species is fully described below, together with localities, host-plants, etc.

Eriophyes lycopersici, sp. n.

Body spindle-shaped, tapering gradually towards anal end. Thoracic shield triangular, apex extended and rounded, not completely covering rostrum. Centre of shield ornamented by a vertical furrow which extends from apex to base, and is bordered on each side by another furrow running parallel to sides of shield; also two longitudinal furrows at sides of shield, the outer one terminating before base. Shield 36 μ long.

Thoracic bristles situated at base of thoracic shield, widely separated, nearer lateral margins than central furrow. Bristles stout, directed backwards, 38 μ long. Warts of thoracic bristles very conspicuous.

Rostrum stout, broad and curved; 11 μ long.

Legs short, frail. First pair 32 μ long; fourth and fifth joints 14 μ long; tarsal bristles 24 μ long. Second pair 30 μ long; fourth and fifth joints 12 μ long; tarsal bristles 20 μ long. Feathered claw 3-rayed, conspicuous. Claw of first pair of legs 9 μ long, stout; second pair 6 μ long. Sternal ledge simple, short. The first pair of coxal bristles in line with anterior end of sternal ledge, and some distance from it. Second pair just above basal end of sternal ledge. The third pair in line with basal end of sternal ledge, directed forwards and remote from it, 34 μ long.

Abdomen with punctuated tergites, 60 in number, basal four being wider than rest. Ventrites similar to tergites. Lateral bristles 20 μ long, situated in line with epigynium. First pair of ventral bristles 50 μ long; second pair short and fine, 10 μ long; and third pair 18 μ long. Caudal bristles 66 μ long, stout at base, acuminate at apex. Accessory bristles present, 4 μ long. Epigynium cup-shaped, 22 μ broad. Cover-flap smooth. Epandrium 16 μ broad. Genital bristles directed backwards, 24 μ long; warts conspicuous.

♀ 190 μ long, 44 μ broad; ♂ 180 μ long.

Host-plant: *Solanum lycopersicum* L. (tomato).

Causes whitish, hairy patches on the stems, fruitlets, fruit and leaf-stalks. The fruits become disfigured and rough-skinned. When the infestation is severe the whole plant is stunted and the crop much reduced.

Distribution.—Morocco. All the tomato-growing districts, including an area of one-hundred-and-twenty miles along the sea-coast.

Described from spirit material collected by Monsieur P. Regnier, Chief of the Plant Protection Service, Rabat, Morocco.

The writer is indebted to Monsieur Regnier and his colleagues for their collaboration in providing suitable spirit material to enable a detailed description being made.

LXXIII.—*On the Occurrence of* Gammarus (Marinogammarus) obtusatus *Dahl* (*Crustacea, Amphipoda*) *new to Britain.* By D. M. Reid, Department of Biology, Harrow School.

THIS species was described by Dahl (I) in 1937 from specimens in the collection made in Finmark by the 'Gunnerus' Expedition, under the leadership of Dr. Carl Dons.

Since the description was published a large number of specimens has come into my possession from a few widely-separated British localities. These differ in no essential ways from the original description, although it is worth noting that the 1st antenna has a long peduncle which sometimes reaches as far as the end of the peduncle of the 2nd antenna. Also, the 3rd epimeral plate has a minute backwardly-projecting point on its free posterior angle (see figure).

Habitat.—This littoral species is not confined to any division of that zone. The greatest number of my specimens was taken from amongst *Fucus vesciculosus.* In this habitat in Wembury Bay 107 specimens of *Gammarus* were collected, all of which were *G. obtusatus*; *G. marinus* Leach was not present. A similar gathering of 69 specimens from this Alga in Rum Bay proved also to be *G. obtusatus.* Apparently the species ranges up to high-water mark, but there only comparatively few and large specimens have been taken. Amongst the *Laminaria*, on the other hand, the specimens seem to be smaller on the average, nor are they so abundant as amongst the *Fucus.*

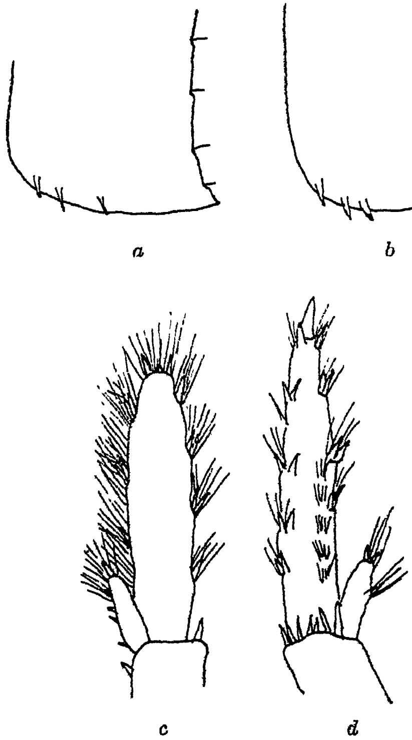
In the north of Scotland most specimens occur at about half-tide mark. A favoured habitat is under stones on coarse, shelly sand. I believe the species occurs in a similar type of habitat in the Scilly Isles.

Localities.—*G. obtusatus* has been taken from the following localities in Britain:—Devon: Wembury Bay and Rum Bay, abundant. Scilly Isles, abundant. North coast of Sutherland: Loch Eireboll, fairly common, specimens small. West coast of Sutherland: Stoer Bay, common.

Thus, the British distribution appears to be wide, and since the Amphipod occurs plentifully at the places mentioned it may be concluded that it is generally distributed round our coasts.

Judging from the relative numbers of *G. marinus* and *G. obtusatus* in my possession, it would seem that the latter is commoner than the former.

Distinguishing Characteristics.—It is not difficult to distinguish the species of the subgenus *Marinogammarus* (2)



a, 3rd epimeral plate of *marinus* type ; *b*, 3rd epimeral plate of *obtusatus* and *stoerensis* type ; *c*, rami of 3rd uropod of *finmarchicus* ; *d*, rami of 3rd uropod of other species.

likely to be met with in British collections. The obtuse posterior angle of the 3rd epimeral plate makes it easy to separate *G. obtusatus* from *G. marinus*. This characteristic, however, will not distinguish *G. obtusatus* from *G. stoerensis* Reid, a species of much smaller size.

The following key will suffice to differentiate members of the subgenus :—

a.	3rd uropod with one joint on outer ramus	*finmarchicus.*
	3rd uropod with two joints on outer ramus	*b.*
b.	3rd epimeral plate sweeping back to a point	*marinus.*
	3rd epimeral plate not sweeping back to a point.	*c.*
c.	♂, 6th joint of 1st gnathopod greater than that of 2nd	*obtusatus.*
	♂, 6th joint of 1st gnathopod less than that of 2nd	*stoerensis.*
	♀, marsupial plates on 2nd gnathopod and pereiopods 3–4 normal	*obtusatus.*
	♀, marsupial plates on 2nd gnathopod and pereiopods 3–4 abnormally large	*stoerensis.*

I have not yet seen any specimens of *G. finmarchicus* Dahl from Britain, nor have I seen *G. stoerensis* except from Sutherland. The latter has been recorded from various places on the Norwegian coast by Stephensen (3).

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(2) Schellenberg, A. ‘ Zoologischer Anzeiger.’ Bd. cxvii. Heft 11–12, p. 267, 1937.
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LXXIV.—*Notes on some Carboniferous Palæoniscids.*

By J. A. Moy-Thomas, M.A., and E. I. White, D.Sc.

Dr. Wellburn’s collection of fossil fishes recently acquired by the Leeds City Museum includes the specimens on which he founded several new species of Carboniferous Palæoniscids. Some of these species were briefly described by Wellburn, but not figured, whereas others were merely named in faunal lists but not described. Examination of the collection showed that these species required revision. This work was very difficult because, in addition to no types being figured or given diagnostic descriptions, the actual specimens were not always adequately labelled. Nevertheless, we have satisfied ourselves that we have succeeded in identifying the specimens to which Wellburn referred.

Wellburn (1901) named without description a new species of *Elonichthys*, *E. traquairi*, from the Better Bed

Coal of Low Moor, Yorkshire. However, in a later faunal list of the Carboniferous fishes of Yorkshire (Wellburn, 1907), no mention is made of *E. traquairi*, but a new species, *E. woodwardi*, is named though not described, and this is also recorded only from the Better Bed Coal of Low Moor. Since no specimen was found in the Wellburn collection labelled "*E. traquairi*," we have come to the conclusion that either he considered his original specimens unworthy of specific rank, or for some other reason later he changed the name to *E. woodwardi*.

The specimens on which *E. woodwardi* was based presented no difficulties of identification. Ten fragments, consisting of a cleithrum in counterpart, a supracleithrum in counterpart, two ridge scales, a mandible, two or three flank scales and two indeterminable fragments of bone, were mounted on a card and labelled "*Elonichthys woodwardi*, sp. nov., Better Bed Coal, Low Moor. Type, Brit. Assocn. 17/9/00. E. D. W." Unfortunately, there is no reason for believing that all these fragments belong to the same species. As a matter of fact, the two ridge scales are so differently ornamented that it is highly probable that they do not. None of the other bones or scales is sufficiently distinctive to exclude them definitely from belonging to described species. We therefore conclude that *E. woodwardi* is not a valid species and warrants no further description. Thus both "*E. traquairi*" and "*E. woodwardi*" must remain indeterminable species of no systematic value.

In 1903 Wellburn described three new species of Palæoniscids from the Millstone Grits, *Rhadinichthys elegans*, *Elonichthys ornatus* and *Elonichthys obliquus*. *Rhadinichthys elegans* is recorded as occurring in the D. shales of the Middle Grits of Summit and of Antley Gate, near Colne, in Lancashire; *E. ornatus* is only recorded from the D. shales of the Middle Grits of Summit, Lancashire; and *E. obliquus* is recorded from the D. shales Middle Grits of Summit, Lancashire, Marsden, Yorkshire, Ivy Clough near Halifax, Yorkshire, and from the Pendleside Limestones of Marsden and Todmorden, Yorkshire (Wellburn, 1907).

Great difficulty was experienced in identifying the types of these species. As well as being unfigured and undescribed in detail, the localities of the types of neither *R. elegans* nor *E. obliquus* are given. However, in

Dr. Wellburn's collection one specimen was labelled "——— *elegans*, sp. nov., 3rd M. Grits, Summit July 4/99/E.D.W. Type *." The words "*elegans*, sp. nov." and "Type *" have clearly been pencilled in at a later date. This specimen, which consists of a number of scattered scales, two lower jaws, two cleithra, a maxilla and a few other fragmentary bones, is undoubtedly the type of *R. elegans*.

In addition to several specimens from Summit labelled "*Elonichthys*, sp. nov.," there are in the collection three specimens, of which one is labelled "*Elonichthys*, sp. nov., 3rd M. Grits, Summit 7–8–99, E.D.W. Type *," another has an indecipherable name followed by "D. shales Mill. Grits. Summit. Todmorden. June 13/99/E.D.W. Type *," and a third is labelled "*Elonichthys* ———, 3rd Millstone Grits, Summit. Type *." In each case the name and the word "Type" have been added in pencil after the rest of the writing. Each specimen consists of a number of head-bones, scattered scales and lepidotrichia. It seems to us reasonable to conclude that the types of *E. ornatus* and *E. obliquus* are included in these specimens, since no other specimens in the collection are labelled either "Type" or "sp. nov." Morever, careful examination revealed that each specimen has some scales which more or less agree with Wellburn's descriptions of the scales typical of both species. His descriptions of the head-bones are not sufficiently diagnostic to distinguish the heads of these species from one another or from those of several described species. It is therefore quite clear that Wellburn was mistaken in making two species, and that *E. ornatus* and *E. obliquus* are synonymous.

Careful examination of the specimen referred to above as the type of *R. elegans* proved that this also had scales identical with those of the two species of *Elonichthys*. We thus conclude that Wellburn was also mistaken in distinguishing *R. elegans* from the other two species. Since Wellburn's generic identifications are only based on the supposed resemblance of the scales to described species of *Rhadinichthys* and *Elonichthys*, in the light of our observations there can be little doubt that *R. elegans* is synonymous with *E. ornatus* and *E. obliquus*.

Comparison of the scales of these specimens with published figures and descriptions, and with all species of Carboniferous Palæoniscids in the British Museum (Natural History), showed that they are indistinguishable from those of *Elonichthys portlocki* (Egerton, 1850, Traquair, 1877, 1901; Smith Woodward, 1891) from the Lower Carboniferous of Maghera and Moyheeland, Ireland. Unhappily, *Elonichthys portlocki* is itself very inadequately known, and it is not possible to be sure whether the Millstone Grit species is really identical in other respects, as well as in scales structure and ornamentation, but until further and better preserved material of both species is found, "*Rhadinichthys elegans*," "*Elonichthys obliquus*," and "*Elonichthys ornatus*" may be treated as conspecific with *Elonichthys portlocki*.

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LXXV.—*Records of some parasitic Worms from the Belgian Congo.* By H. A. BAYLIS, M.A., D.Sc., Department of Zoology, British Museum (Natural History).

THE parasites mentioned below were collected by Dr. J. Schwetz, of the Faculty of Medicine, Brussels University, in 1936, and a representative set of the material has been kindly presented by him to the British Museum (Natural History). The region in which most of them were obtained is the valley of the River Kwango, a tributary of the Congo, forming the boundary between the Belgian Congo and Angola, and this valley is the locality from which the species are recorded, unless otherwise stated.

The following is a list of provisional determinations. Where a query is attached to the specific name, it indicates that the determination is regarded as somewhat uncertain for one or more of several reasons: the absence of one sex, or the condition of the material; the inadequacy of existing descriptions; or the presence of small differences which might prove, on the comparison of longer series of specimens, to be of specific importance.

TREMATODA.

Fam. **Dricrocœliidæ.**

Mesocœlium monodi Dollfus, 1929. Host, *Chamæleon etienii.*

CESTOIDEA.

Fam. **Anoplocephalidæ.**

Inermicapsifer arvicanthidis (Kofend, 1917). Host, *Mastomys coucha.*

Fam. **Davaineidæ.**

Raillietina (*Raillietina*) *baeri* Meggitt & Subramanian, 1927. Host, *Mastomys coucha.*

Fam. **Hymenolepididæ.**

Hymenolepis ? microstoma (Dujardin, 1845). Host, *Mastomys coucha.*

NEMATODA.

Fam. **Ascaridæ.**

Some large Ascarid larvæ were found on two occasions encapsuled under the peritoneum of *Steatomys pratensis.*

Fam. **Heterakidæ.**

Ascaridia numidæ (Leiper, 1908). Hosts, *Guttera edouardi, Chamæleon etienii.*

The finding of this species in a chamæleon is interesting. Gendre (1911) has recorded the occurrence of *Heterakis calcarata* (later recognized as *A. numidæ*) in a lizard, *Mabuya perroteti*, in Dahomey. The worms were regarded as pseudoparasites, and it was suggested that the lizard had fed on the viscera of a guinea-fowl. It is not easy to account in this way for the presence of the worms in a chamæleon, in view of the habits of this animal. Another possibility, however, is that living worms passed in the fæces of guinea-fowls might have attracted the attention of the reptiles and been swallowed by them.

Strongyluris brevicaudata Müller, 1894. Host, *Agama colonorum*. Locality, Kimbemba, lower Congo.

Africana acuticeps (Gedoelst, 1916). Host, *Chamæleon etienii*.

Subulura distans (Rudolphi, 1809). Hosts, *Cercopithecus schmidti*, *C. neglectus*, *Papio cynocephalus*.

Subulura elongata (Seurat, 1914). Host, *Steatomys pratensis*.

This species was originally recorded from the gerbil, *Dipodilla campestris*, in Southern Algeria. The present writer (1928) has recorded *Numidica* [*Subulura*] *boueti* (Gendre, 1911) as occurring in *Lophuromys sikapusi* and *Praomys tullbergi* in Nigeria. Re-examination of the specimens shows, however, that they should probably be referred to *S. elongata*. The number and arrangement of the caudal papillæ of the male in the two forms seem to be exactly the same, but *S. elongata* has equal and similar spicules, whereas in *N. boueti* the left spicule is considerably shorter than the right, and is imperfectly chitinized.

Fam. **Oxyuridæ.**

Pharyngodon sp. (near *mabuyæ* Sandground, 1936). Host, *Mabuya maculilabris*.

Syphacia ? *nigeriana* Baylis, 1928. Hosts, *Taterona* sp., *Praomys tullbergi*.

Fam. **Ancylostomidæ.**

Agriostomum sp. (near *equidentatum* Mönnig, 1929). Host, *Hippotragus equinus*.

Fam. **Trichostrongylidæ.**

Oswaldocruzia ? *loveridgei* Sandground, 1936. Host, *Mabuya* sp. Locality, Tshela, Mayumbe Forest.

Heligmonina ? *aenomyos* Baylis, 1928. Host, *Aenomys bacchante*.

Fam. **Spiruridæ.**

Protospirura muricola Gedoelst, 1916. Hosts, *Mastomys coucha*, *Steatomys pratensis.*

Both Gedoelst (1916) and the writer (1928) found the right spicule of the male of this species shorter than the left. In the present specimens, however, the right spicule is considerably longer than the left, measuring up to about 0·6 mm.

Streptopharagus pigmentatus (v. Linstow, 1897). Host, *Cercopithecus schmidti.*

Gongylonema pulchrum Molin, 1857. Host, *Tragelaphus scriptus.* Locality, River Lukulu.

This is believed to be the first record of this parasite from an African antelope. The worms were "sewn" in the usual manner into the lining of the œsophagus.

Physaloptera caucasica v. Linstow, 1902. Host, *Papio cynocephalus.*

Physaloptera ? *varani* Parona, 1889. Hosts, *Chamæleon etienii*, *Gerrhosaurus flavigularis nigrolineatus.*

Physaloptera ? *pallaryi* Seurat, 1917. Host, *Agama colonorum.*

Fam. **Filariidæ.**

Dirofilaria corynodes (v. Linstow, 1899). Host, *Colobus congolensis* (in subcutaneous connective tissue).

Setaria hornbyi Boulenger, 1921. Host, *Hippotragus equinus.*

Setaria ? *congolensis* Railliet & Henry, 1911. Host, *Potamochœrus porcus.* Locality, Malela, lower Congo.

Fam. **Trichinellidæ.**

Trichuris ? *trichiura* (L., 1771). Hosts, *Cercopithecus schmidti*, *C. neglectus.* Locality of the latter, River Lukulu.

Trichuris muris (Schrank, 1788). Host, *Taterona* sp.

ACANTHOCEPHALA.

Fam. **Oligacanthorhynchidæ.**

Macracanthorhynchus hirudinaceus (Pallas, 1781). Hosts, *Potamochœrus porcus* (Malela, lower Congo); *Papio cynocephalus.*

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LXXVI.—*A Case of Crossing in Spiders.*

By G. H. LOCKET, M.A., M.Sc., F.Z.S.

THE first properly established case of successful mating between spiders of different species is recorded by Gerhardt (1928). He observed the copulation of the male of *Eresus niger* with the female of *E. walckanaeri.* The process appears to have been normal, except that the insertion of the palps did not last so long as was sometimes the case with *E. walckanaeri*, but the swelling of the hæmatodocha took place as usual.

Bonnet (1933) tried to induce females of *Dolomedes plantarius* Cl. to accept males of *D. fimbriatus* Cl. But, although the males were willing enough to mate, they could not overcome the barrier of the females' opposition to males of another species. Two cases of mating, accompanied by the swelling of the hæmatodocha, were established when the females were anæsthetised, only one palp being inserted.

The following observations were made on two closely-related Salticid spiders, *Salticus scenicus* Cl. and *S. cingulatus* Panz. In two cases males of the former species succeeded in mating with females of the latter, the swelling of the hæmatodocha, although it lasted only some seconds, was clearly visible. There was no apparent unwillingness on the part of the females of either species, consequently a factor which is usually very important in preventing crossing was not operative.

The following are the details of the observations :—

I. (18. 5. 34).—A male *Salticus scenicus* courted a female of *Salticus cingulatus* and then attempted to copulate; one swelling of the bulb was clearly visible. This female also copulated with a male of her own species.

II. (18. 5. 34).—A male of *S. scenicus* courted and attempted to copulate with a female of *S. cingulatus*, but did not apparently succeed. Later this male was found eating the female.

III. (9. 5. 35).—A male *S. scenicus* was introduced to a female *S. cingulatus* in a tube. He was clearly very excited, his abdomen pulsating. He approached the female, who had only just moulted, with practically no display, and then crawled on top of her and made attempts to apply his palps. Two distinct swellings of the bulb were seen. The male then ran around, the female appearing very interested and watching him. Later he crawled over her repeatedly, apparently beginning to spin her in.

IV. (14. 5. 35).—A male of *S. scenicus*, on being introduced into a tube containing a female *S. cingulatus*, immediately attacked and killed her. He was rather above average size.

V. A male *S. cingulatus*, on being introduced into a tube containing a female *S. scenicus*, at once started courting and then attempted to get onto her back, she being perfectly willing. The female watched the male running about with great interest, and at one time approached him with outstretched legs. He made repeated attempts to get on to her back, but she always moved away after the first time.

The following points were noted in connection with the mating of *S. cingulatus* (male and female both of this species) :—

The males were sometimes very much larger than the females. The jaws of the males (which are positively allometric, larger specimens having jaws much larger relative to the body-size) were often spread out in courting and must be fairly striking objects. Courting on the other hand is often very restricted, the male then approaching the female and at once beginning to apply his palps. Each application may last 10–12 minutes, with the bulb continuously inflated but pulsating; the palps are applied alternately. Eventually the male constructs the usual silk tent and they remain in this for days, but it does not seem necessary for copulation in the first place.

Dr. A. R. Jackson very kindly identified all the specimens mentioned.

It appears that males of *Salticus scenicus* are more aggressive towards females of the other species than are males of *S. cingulatus*, although mating between both sexes of both species appears to be possible. In view of the fact that the habitats of the two species may on occasions be adjacent and even overlap, this possibility is not without interest. The strongest factor which separates them is, in my opinion, that of moisture. It was very clear when the spiders were kept in wide specimen-tubes that *Salticus cingulatus* was very much more susceptible to drought than *S. scenicus*. Several of the former species were lost through lack of water, but never one of the latter. However, where their territories overlap it seems quite possible that crosses might occur, and Dr. Jackson has suggested to me that it is not impossible that the very rare *Salticus zebraneus* C. L. K. might be such a hybrid, as in some respects it is intermediate in structure between the two species which were watched. In all cases the sexual organs are simple, and there seems no reason why successful mating should not sometimes occur. It is hoped that further information on this point may be obtained in the future.

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LXXVII.—*The Marine Crustacea of Ardglass Harbour, Co. Down.* By RANALD MACDONALD.

DURING the early part of the month of March of last year I spent a week at Ardglass, Co. Down, with the Easter vacation course in Marine Zoology, organized by the Zoology Department of Queens University. While at Ardglass, and also during a day's dredging on Strangford Lough, I collected a considerable number of Marine Crustacea. As a number of the specimens in the Amphipoda portion of my collection have, upon examination, proved to be of considerable faunstic interest, I have compiled the following list of all the Crustacea obtained, and in the case of the Amphipods given brief notes on the Irish distribution of the more unusual forms. For the sake of completeness Strangford specimens have been included.

SYSTEMATIC LIST.

Subclass CIRRIPEDIA.

Balanus porcatus da Costa.

Strangford Lough, off Killyleagh, on dredged shells of *Pecten maximus* (Linné).

Balanus balandoides (Linné).

Common on rocks at Ardglass Harbour.

Order TANAIDACEA.

Apseudes talpa (Mont.).

Strangford Lough, dredged.

Order ISOPODA.

Idotea baltica (Pallas).

Rocks at Killough pt.

Idotea neglecta G. O. Sars.

Ardglass Harbour, among weed in rock pools.

Jæra marina (Fabricius).

Brackish pools on shore, Strangford side of Kilclief; also pools at Ardglass Harbour.

Ligia oceanica (Linné).

Ardglass Harbour, under stones in suitable places at and above H.W.M.

Order AMPHIPODA.

Lysianassa ceratina (Walker).

Strangford Lough, off Killyleagh, dredged.

Bathyporeia pilosa Lindström.

Ballyculter, in pools at H.W.M. in sand.

Urothoe pulchella (A. Costa).

Strangford Lough ?

Stenothoë monoculoides (Montagu).

Ballyculter, on orange ascidian ? Under stones at L.W.M.

Panoplœa minuta (G. O. Sara).

Strangford Lough, off Killyleagh, dredged. (First record for East Coast of Ireland.)

Iphimedia obesa Rathke.

Strangford Lough, off Killyleagh, dredged.

Pontocrates arenarius (Bate).

Ardglass Harbour, dredged in sand. (First record E. Coast of Ireland. Previous Irish records: Blacksod Bay, off the White Strand, Bofin Is. Clare Island Survey.)

Apherusa jurinei (Milne Edwards).

Ardglass Harbour, rock pools.

Melita obtusata Mont.

Two miles off Strangford Bar, dredged.

Gammarus marinus Leach.

Shore at Ballyculter, near Kilclief, and Ardglass Harbour, in pools.

Gammarus locusta (Linné).

Ardglass Harbour.

Gammarus duebeni Lilljeborg.

Brackish water, Killough Harbour.

Orchestia gammarella (Pallas).

Ballyculter, and Ardglass Harbour.

Microdeutopus danmoniensis (Bate).

Strangford Lough, off Killyleagh, dredged. (First record for E. Coast of Ireland. Previous Irish records: Blacksod Bay, Ballinakill, Bofin Harbour, Valentia. Clares Is. Survey.)

Amphithœ rubricata (Montagu).

Ardglass Harbour, in pools and under stones.

Suborder CAPRELLIDEA.

Caprella acanthifera Leach.

Dredged in Ardglass Harbour.

Order SCHIZOPODA.

Praunus flexuosus (Müller).

Ardglass Harbour, in pools and brackish water. Killough Harbour.

Order DECAPODA.

Suborder NATANTIA.

Leander serratus (Pennant).

Common in pools, Ardglass Harbour.

Leander squilla (Linné).

Common in pools, Ardglass Harbour.

Palæmonetes varians (Leach).

Killough Harbour, brackish water.

Crangon vulgaris Linné.

Dredged in Ardglass Harbour, brackish water, Killough.

Suborder REPTANTIA.

Galathea nexa Embleton.

Strangford Lough, 8 fms.

Porcellana platycheles (Pennant).

Ardglass Harbour, under stones.

Porcellana longicornis (Linné).

Ardglass Harbour, under stones.

Eupagurus bernhardus (Linné).

Ardglass Harbour, in pools.

Carcinus mænas (Pennant).
Ardglass Harbour.

Cancer pagurus Linné.
Small ones common in Ardglass Harbour; under stones.

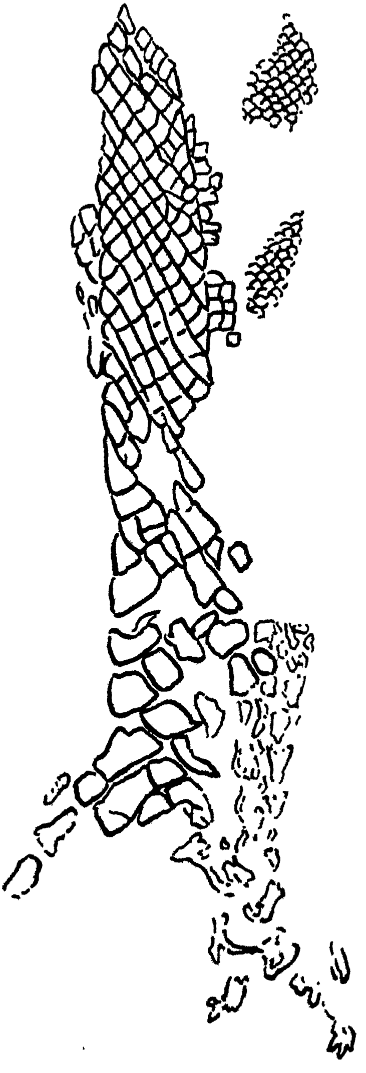
Six of the above specimens were collected, after my departure, by other members of the party, and were kindly lent to me by the Zoological Department of Queens University, viz., the following:—

Idotea baltica, Urothœ pulchella, Melita obtusata, Galathea nexa, Gammarus duebeni, Palæmonetes varians.

Finally, my thanks are due to Professor Flynn and to Mr. G. Williams, M.Sc., who was in charge of the course, for their great kindness in allowing me to join the expedition, also to Dr. Watkin, of the University College of Wales, Aberystwyth, for examining and naming the critical specimen of *Bathyporeia,* which I submitted to him for his opinion.

LXXVIII.—*Note on Ostracoderm Tails.* By ERROL IVOR WHITE, D.Sc., F.G.S., Department of Geology, British Museum (Natural History).

PRIOR to the discovery a few years ago of complete specimens of *Pteraspis* in the Dittonian of Herefordshire, the tail of this genus was known only by a very few fragments of squamation and a number of isolated scales (White, 1935, p. 413). Noteworthy among the former was a specimen from Perthshire (apparently from the Bridge of Allan Quarry, which, so far as I know, is the only locality in Scotland that has produced specimens of *Pteraspis,* and is now unfortunately used as the local refuse-pit)—this specimen was figured by Lankester (1868, p. 33, pl. v. fig. 1), who referred it to *P. mitchelli* Powrie. It was described as being "a few rhomboidal scales," but in point of fact it was quite an extensive piece of squamation, over 7 cm. long, and apparently included the base of the caudal fin itself. This fragment appeared to be very different from the complete tails of *P. rostrata* (Ag.) from Herefordshire: it seemed too long and narrow, and the anterior scales were much larger and lacked the typical diamond-shape of those in the other specimens, while the caudal body-prolongation



Imperfect caudal squamation of *Cephalaspis* sp., previously referred to *Pteraspis mitchelli* Powrie. Roy. Scot. Mus., Powrie Coll. no. 129. ×2.

was clearly marked off from the web, instead of grading into it. Last year, while in Edinburgh, I was able to examine this specimen, thanks to the courtesy of Dr. A. C. Stephen, the Keeper of the Natural History Departments of the Royal Scottish Museum, and found that it was not referable to *Pteraspis* at all, but to *Cephalaspis* (*cf.* Stensiö, 1932, pl. xxxiv. fig. 2). It extends from about the level of the middle of the dorsal fin to somewhat less than halfway along the caudal body-extension. Lankester's figure does not show the scales of the web of the fin, of which there are two patches in addition to those in contact with the extension (text-fig.). Some of the scales show clearly the radiating and ascending canals of the mucous canal system (*cf.* Stensiö, 1932, p. 61, text-fig. 19).

It is, of course, impossible to say to which species of *Cephalaspis* this fragment belongs, and none is recorded from this particular quarry.

Unfortunately, this specimen now loses much of its value, for many much finer tails of this genus are known, especially from Scotland; whereas those of *Pteraspis* are exceedingly rare, and not more than a dozen or so fragments of *Pteraspis* of any kind are recorded from North of the Border, and all come from this same quarry.

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LANKESTER, E. R. 1868. "Monograph of the Fishes of the Old Red Sandstone of Great Britain.—Part I. Cephalaspidæ." Mon. Palæontogr. Soc. London.

STENSIÖ, E. A. 1932. "The Cephalaspids of Great Britain." Brit. Mus. (Nat. Hist.), London.

WHITE, E. I. 1935. "The Ostracoderm *Pteraspis* Kner, etc." Phil. Trans. Roy. Soc. London, ser. B, vol. ccxxv. pp. 381–457.

LXXIX.—*Correction of a Generic Name in Orthoptera.*

By B. P. UVAROV, D.Sc., British Museum (Natural History).

IN my article on 24 new generic names in Orthoptera (Ann. & Mag. Nat. Hist. ser. 11, vol. iii., April 1939), at the bottom of p. 458, a new name has been proposed for *Bufotettix* Uvarov, 1929 (Acrididæ). The new name was spelt *Batrachacris*, which would make it preoccupied by the same name used in my paper a few lines higher up, but the spelling was due to a *lapsus calami*, and the name should read **Batrachidacris**, n. n., for *Bufotettix* Uvarov, 1929.

BIBLIOGRAPHICAL NOTICES.

An Introduction to Biology. By E. J. HATFIELD, M.Sc. Oxford: Clarendon Press. London: Humphrey Milford, 1938. Pp. 540. Price 6*s.* 6*d.*

THIS book, in the words of its author, "embodies the attempt of a practising teacher to achieve that synthesis" of botany and zoology "into an organic whole," and seeks "to emphasize the experimental method, in view of its value in training precise and logical thought."

Throughout, the fundamental similarities in living organisms of the plant and animal world have been emphasized, although possibly in some instances it may be thought that these comparisons have been overstrained.

The subject-matter covers the existing school-certificate syllabuses in biology, but the author has wisely interpreted the needs of the students in generous fashion. The book is divided into eight sections, to which are added two appendices. In the introductory section a short survey of the history of biology is followed by a chapter on cells and the structure of living organisms, an account of *Amœba proteus*, and a chapter on the general composition of living matter. The remaining seven sections are: food and its manufacture, the food of animals, sensitivity and coordination, food as a source of energy, excretion, growth, and reproduction. The whole is admirably illustrated by clear drawings and diagrams, many of which are original, and the text contains directions for experiments to illustrate the subject under consideration.

Where so much is commendable much space should not be given to the notice of errors; but it is misleading to find the oft-repeated but erroneous statement on p. 249 that "the main root of a seedling is negatively heliotropic," and on the following page the figure is surely of a seedling of *white mustard*, one of the plants whose roots do show growth curvatures in response to unilateral illumination. The direction of curvature of the roots of the two left-hand seedlings in figure 71 and the word *zymase* for *glycogenase* on p. 143 will doubtless be altered in future editions.

This introduction to biology will be greatly appreciated by, and it can be warmly commended to, teachers and pupils.

N. F.

Methods and Materials for teaching Biological Sciences. By D. F. MILLER and G. W. BLAYDES. London: McGraw-Hill Publishing Co., Ltd. Price 21*s.*

THIS work will be warmly welcomed by teachers and students of *biology*; by those who believe that biology is not a mixture of scraps of botany and zoology; by those who believe that the study of biology demands hard thinking and constructive thought; and by those who believe that the study of biology, more than that of other sciences, demands some background of knowledge of social conditions and should lead on to an intelligent comprehension of the defects of our social structures and of practical methods for removing some of those defects.

It is refreshing to find an elementary work on biology which analyzes some of the processes which pass for thought in this fashion: "Perhaps the most universal exhortation of teachers to students has always been, 'Now think!' Also the expression 'I think' is a common one. What does one really do when he says he thinks? The teacher usually means 'recall,' for she is probably asking the student to repeat what was included in an assignment. What the adult usually means by 'I think' is 'I feel,' for what he is doing is emotionalizing and taking stock of his prejudices to determine his attitude on this or that. Scientific thinking is the antithesis of this."

It must not be imagined that the book is one which deals entirely with generalities and generalizations. It is divided into two parts. The first is concerned with principles and classroom methods, and will be read with great interest and profit by all teachers of both natural and physical sciences. Of the ten chapters which comprise this portion those on the objectives of biological teaching, on methods of presentation, on making a teaching plan, on types of courses, and on trends in the curriculum are specially worthy of mention. The second part, which deals with the preparation and uses of classroom materials, is a most valuable storehouse of hints and directions for the collection and preservation of specimens and for the making of simple laboratory experiments which range over the whole field of elementary biology. Simple but effective methods are described, and the possibilities of a "cork-wax-pfennig" biology are most convincingly demonstrated. Indeed, the book should be of great use not only to an academic generation, but to all natural history enthusiasts who would attain an outlook wider than that of the mere collector.

One or two errors have been overlooked (*e. g.*, on pages 240, 398), and the word *cions* (p. 386) looks strange to modern eyes.

The book is admirably produced, is well illustrated, and may be strongly recommended. N. F.

A Butterfly Book for the Pocket. By EDMUND SANDERS. Oxford University Press. Price 7*s.* 6*d.*

PUBLISHED on March 23rd, this is the fourth and latest in the series of "Oxford's Pocket Books of Natural History." To write a book on Butterflies which can encourage the beginner, and be of interest and value alike to the nature-lover and the scientifically minded student, is not an easy task. Mr. Sanders has been completely successful, and gives us a very readable account of all the British species. The system of placing the pictures opposite the descriptions is an admirable one. There are 219 separate coloured figures of the butterfly, and 114 showing the larva and pupa. All these are represented life size on 62 plates, and the figures are really excellent. The introductory chapter runs to 70 pages, and is not the least important part of the book. Descriptions of the early stages and structure are easy to follow through the clear and accurate text-figures. An interesting account is given of the general larval biology, and of the habits and variation of the imago. The facts given are in accordance with the most recent knowledge. The author has wisely omitted instructions for collecting and setting, and we agree that "An hour's personal teaching is better than any reading."

Each family, genus, and species is briefly and concisely described. With each genus is given a figure of the venation, the veins being numbered, so avoiding the confusion always arising when names are applied. The essential characters of each species are noted, with brief accounts of distribution, variation, early stages, and life-history. Each account is accompanied by an outline map to show the distribution, and by a table showing the times of appearance of the egg, larva, pupa, and imago.

It is difficult to be critical of a book of this character. Only one misprint is noticed; on p. 8, H. M. Edelsten is given as Eddlesten. One notes the absence of author's names, except for the genera; the contracted forms of "Butterfly" in the Time-Tables, instead of the initials E, L, P, B; the replacement of imago, or sexually mature insect, by the general term "butterfly"; the use of "proboscis" for tongue (usual in most books); the use of "joint" for segment (also usual). On p. 19 the author shows that the so-called "broods" of butterflies are more correctly termed generations, yet, later in the book, the word "brood" is frequently used.

These trifling points do not detract from the value the book will have for those who want to identify with ease any butterfly they may see or catch in the British Isles. The essential facts of British Butterfly Life are presented concisely in a manner that should appeal to all lovers of insect life, and it is amazing how much information is contained in these 332 pages. G. T.

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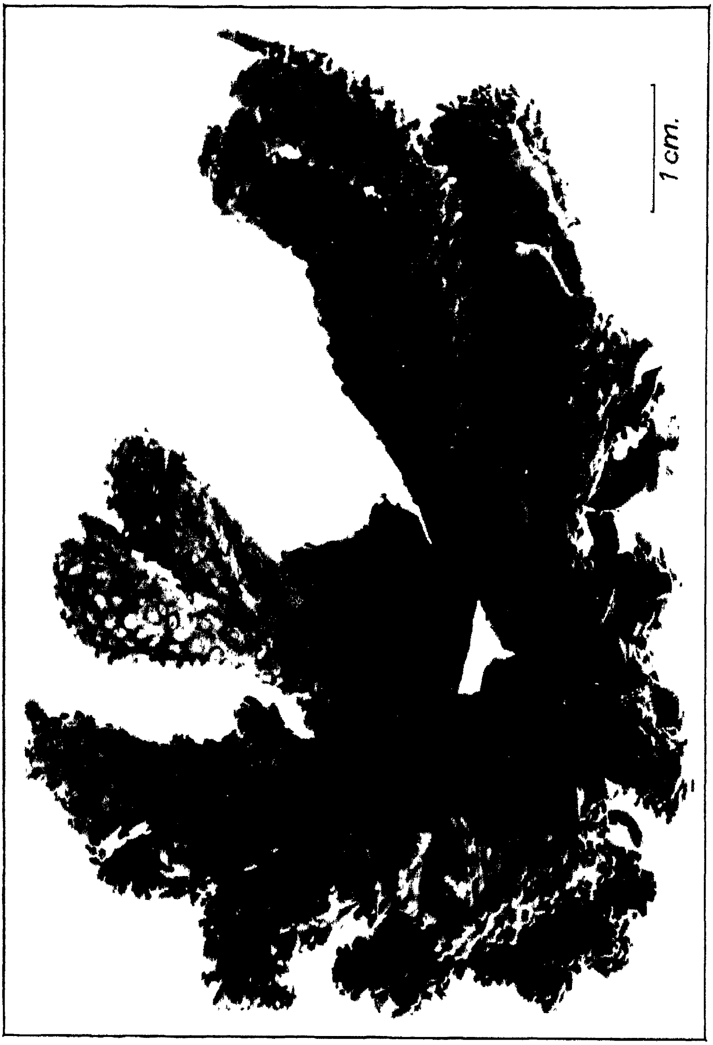
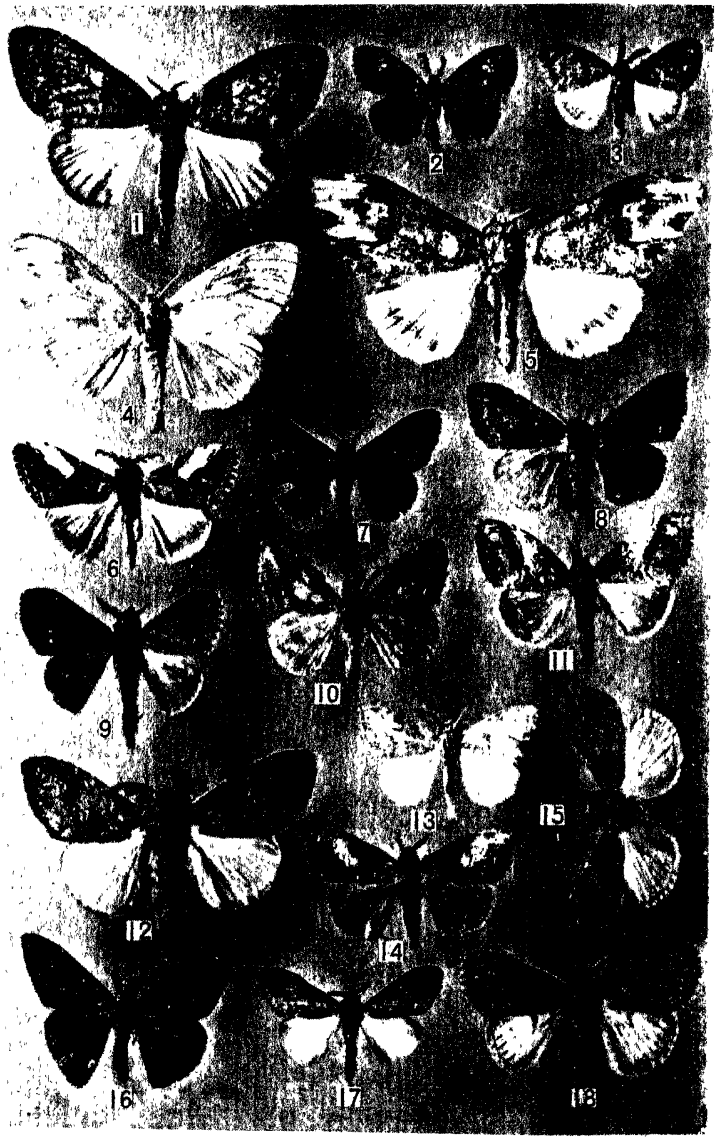


Efflatounaria tottoni, sp. n.



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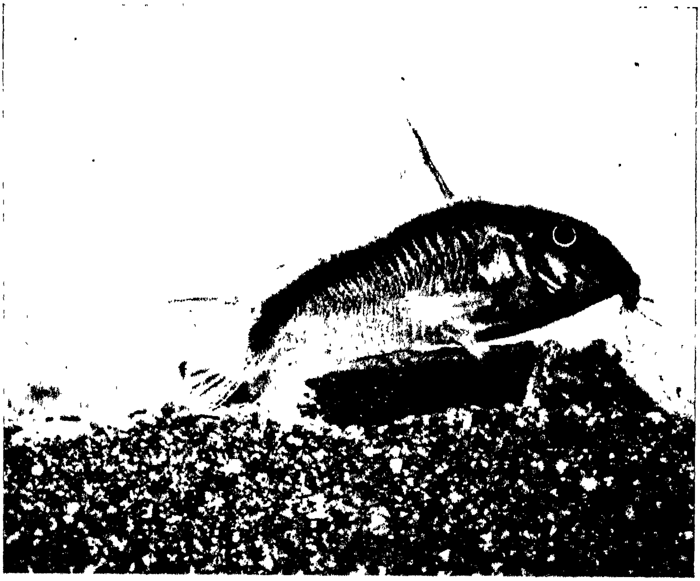
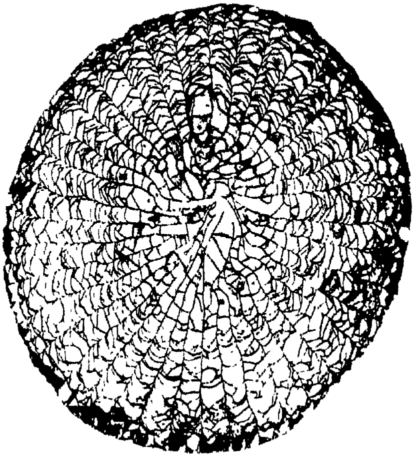


Corydoras arcuatus, sp. n. (type).



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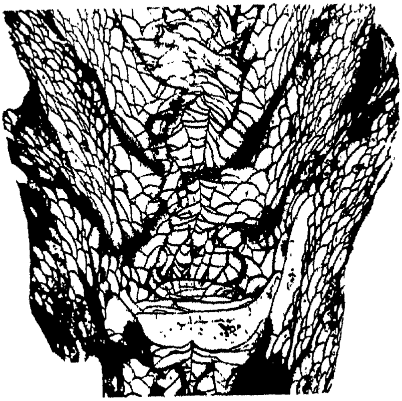

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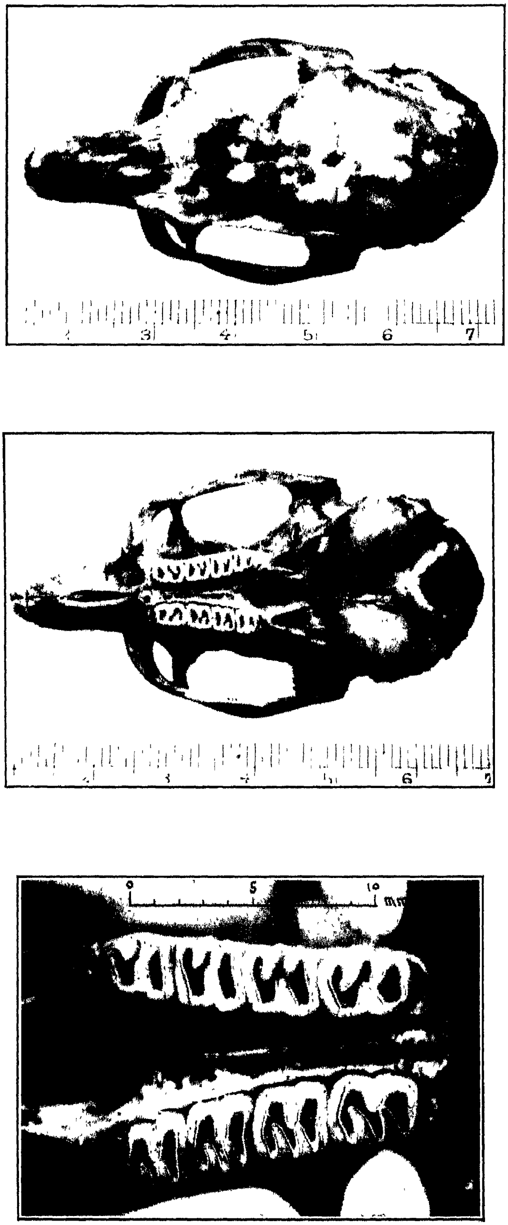
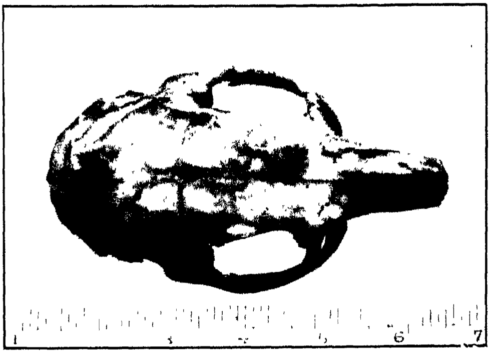
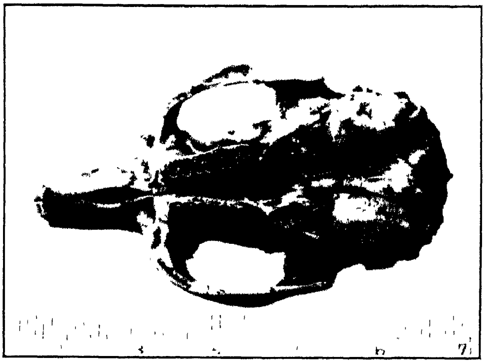
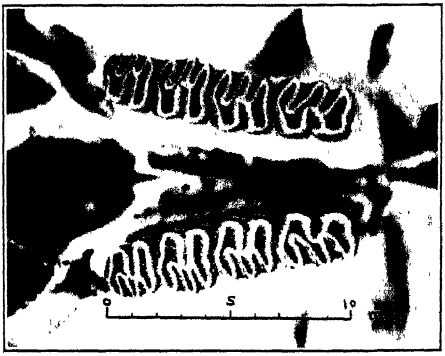
Mictophyllum nobile, gen. et sp. n.



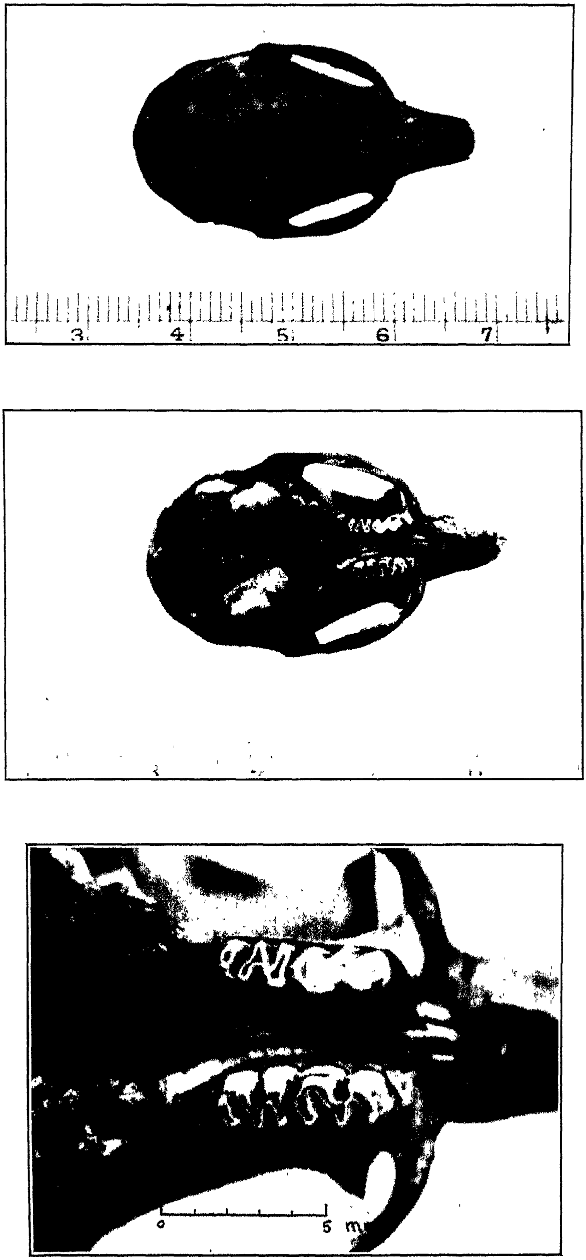
Capromys nana Allen, adult ♂.







Capromys nana Allen, adult ♀.



Capromys nana Allen, juv. ♂.

MAULIK.

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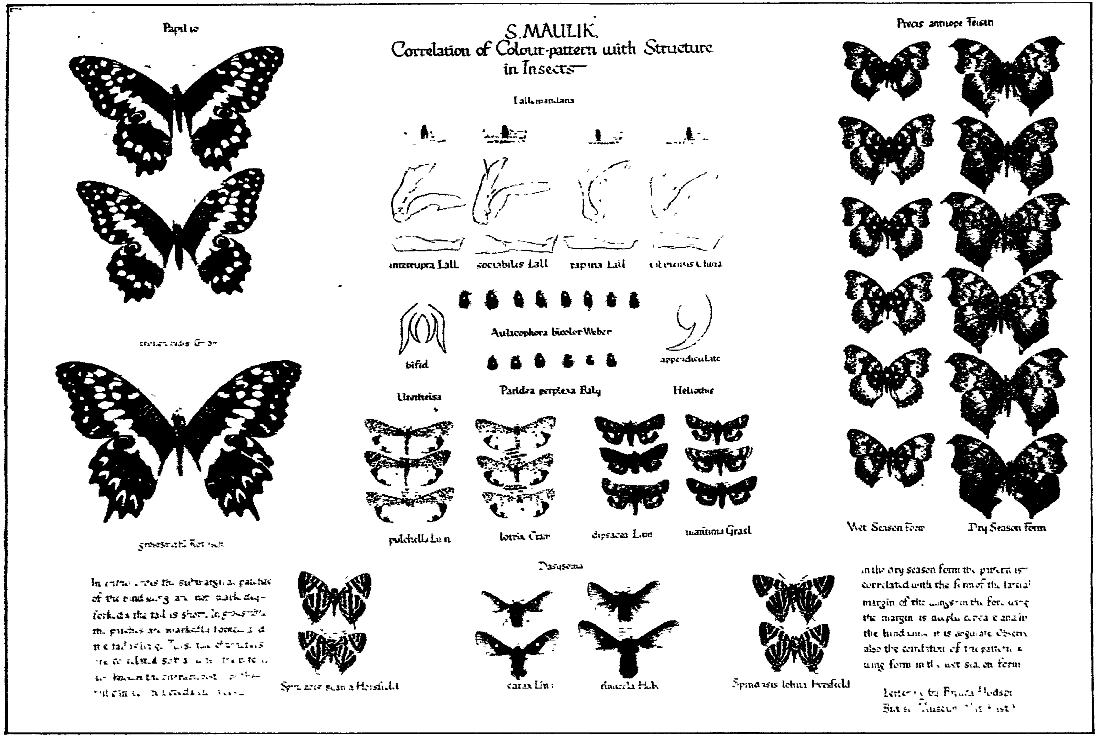
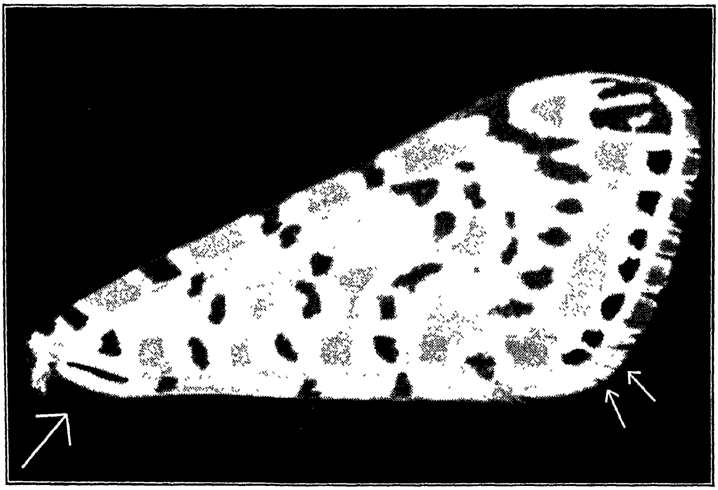
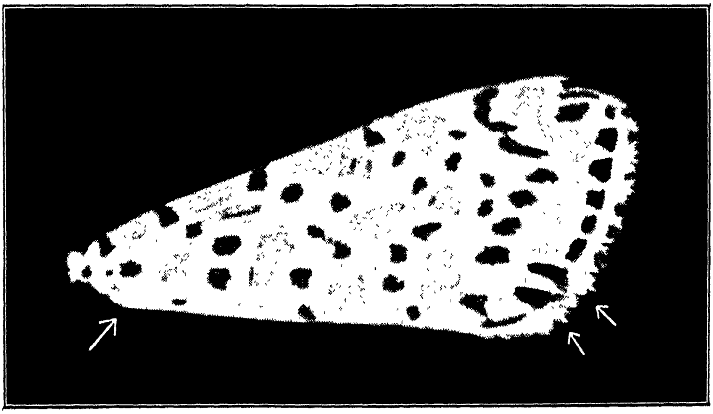
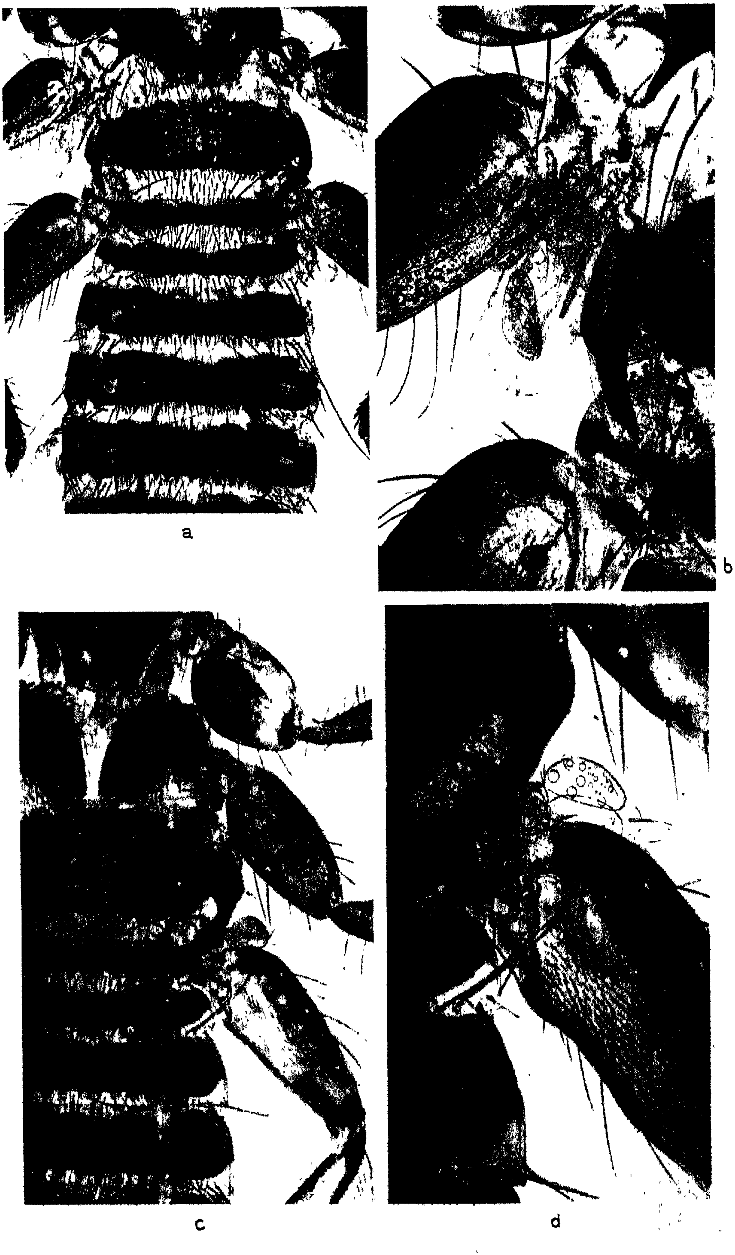

S. MAULIK.
Correlation of Colour-pattern with Structure in Insects
Papilio
grosesmithi Rot
In erithonius the submarginal patches of the hind wing are not much developed as the tail is short. In grosesmithi the patches are markedly formed and the tail is long.
Lallemandana
interrupta Lall.
sociabilis Lall.
rapina Lall.
bifid
Aulacophora bicolor Weber
appendiculate
Utetheisa
Paridea perplexa Baly
Heliothis
pulchella Linn
lotrix Cram
dipsacea Linn
maritima Grasl
Dasysoma
Spindasis syama Horsfield
catax Linn
rimicola Hub.
Spindasis lohita Horsfield
Precis antiope Feisth
Wet Season Form
Dry Season Form
In the dry season form the pattern is correlated with the form of the lateral margin of the wings—in the fore wing the margin is deeply concave and in the hind wing it is angulate. Observe also the correlation of the pattern & wing form in the wet season form
Lettering by Francis Hodson
British Museum (Nat. Hist.)



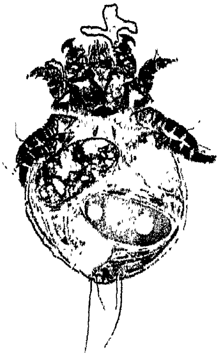
Forewing of Utetheisa pulchella Linn.



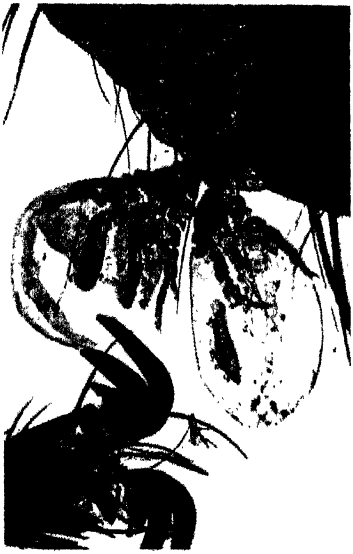
Forewing of Utetheisa lotrix Cram.



Figs. a–d M. CAULOTOON SPEISER ATTACHED TO TRINOTON sp.



a



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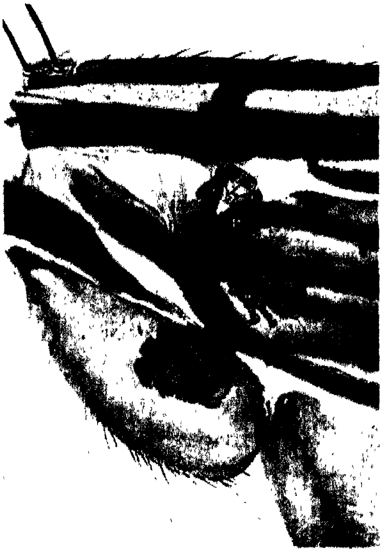

c

Fig. a. M.CAULOTOON SPEISER, ♀.
Fig. b. M.ANCHORA SERG. AND TROUS. ON P. MAURA (BIGOT).
Fig. c. MICROLICHUS sp. ON WING OF O.AVICULARIA (LINN.).

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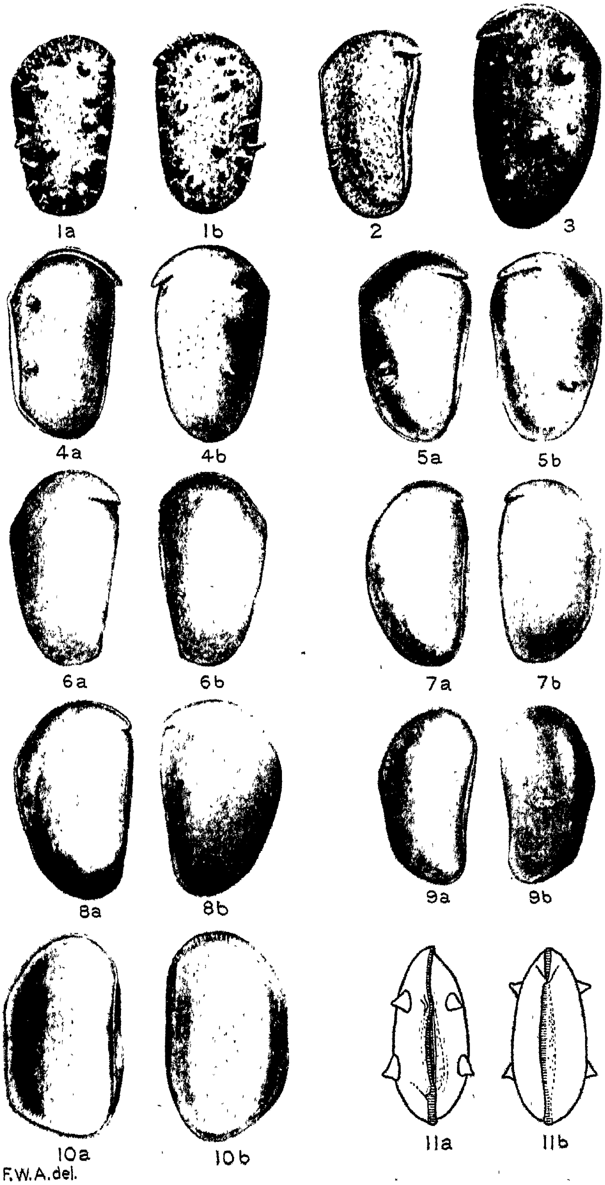
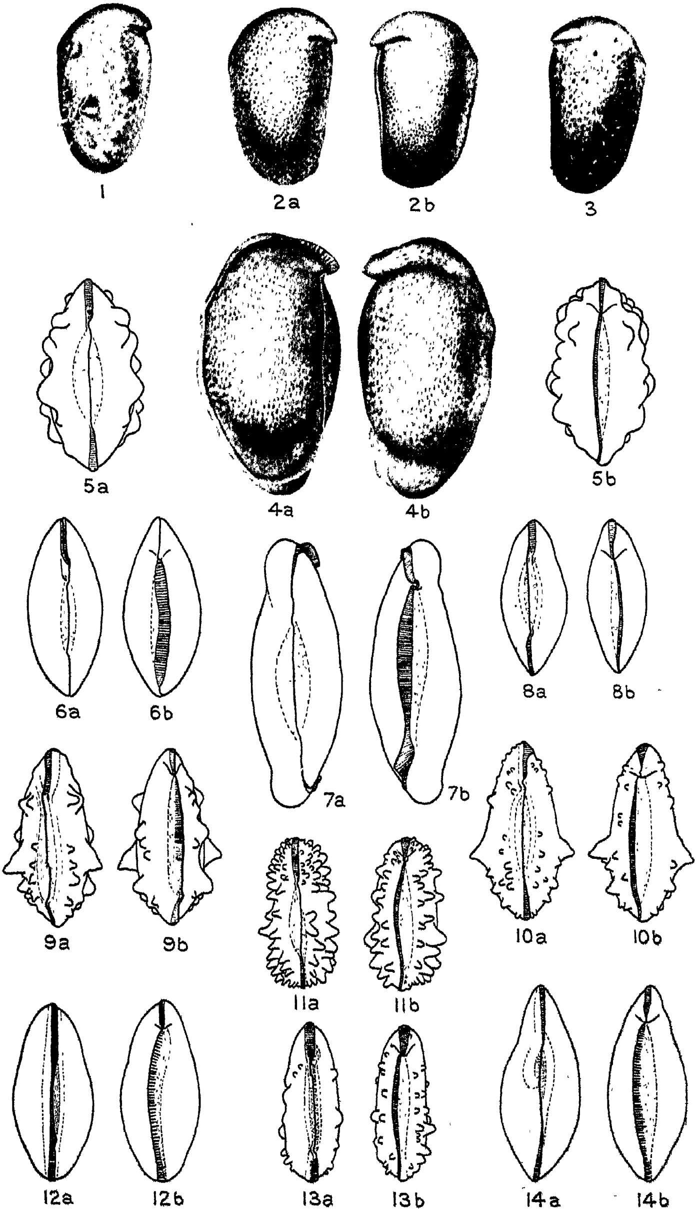


F.W.A. del.

WEALDEN AND PURBECK OSTRACODA



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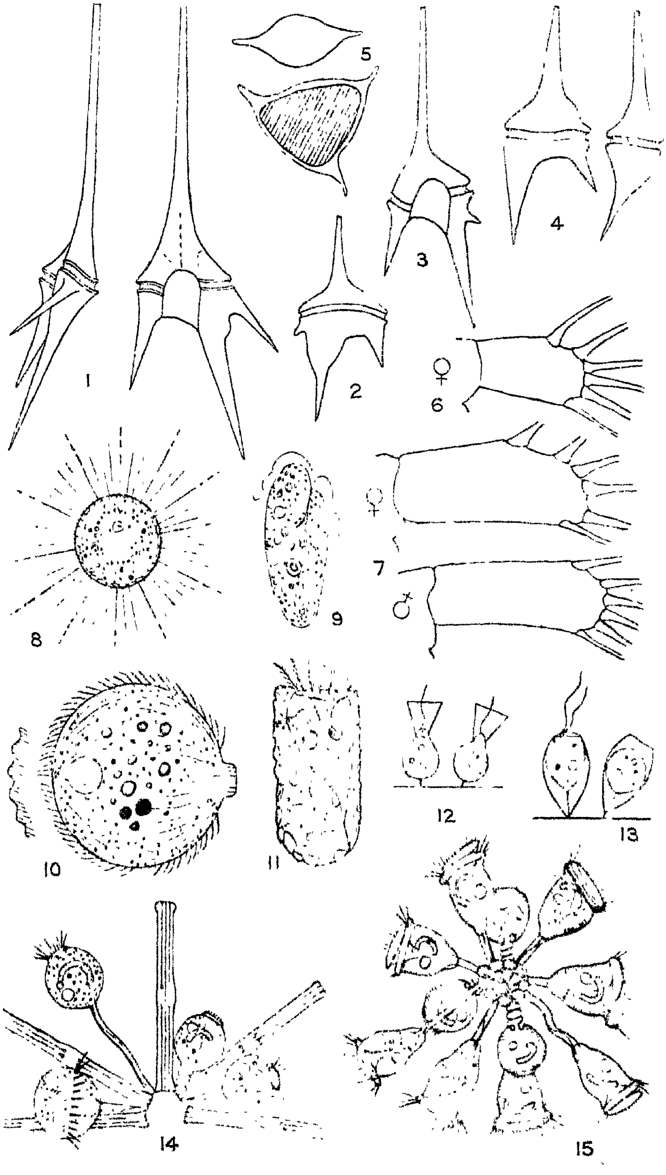
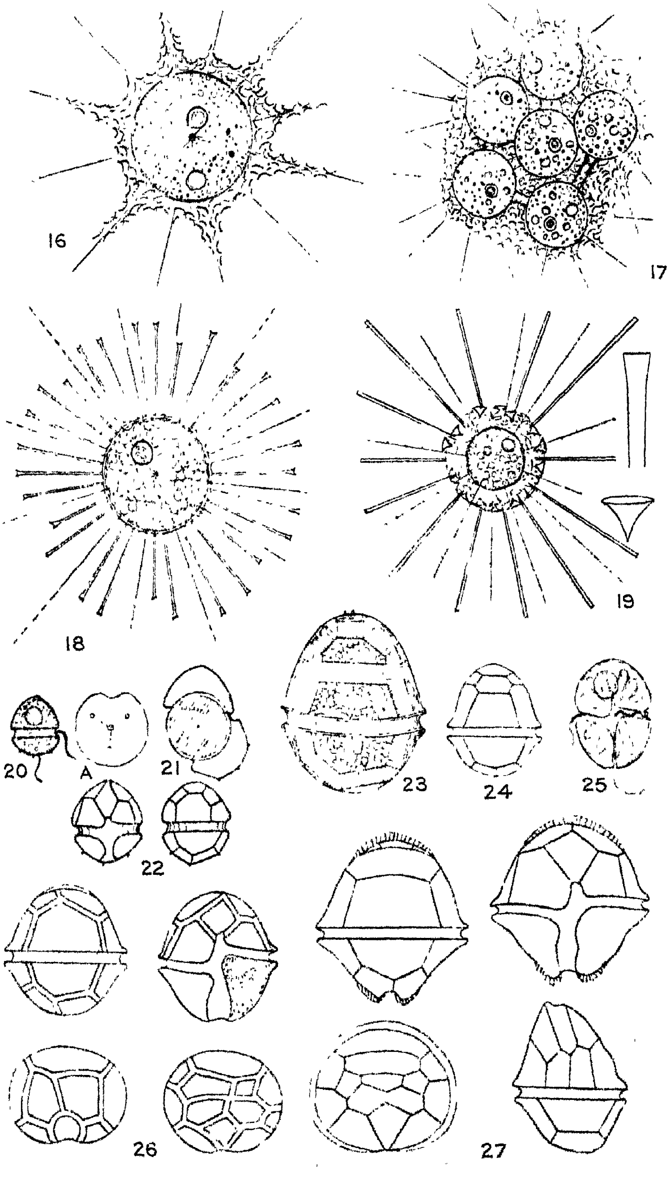
WEALDEN AND PURBECK OSTRACODA



PLANKTON FROM LAKE WINDERMERE.

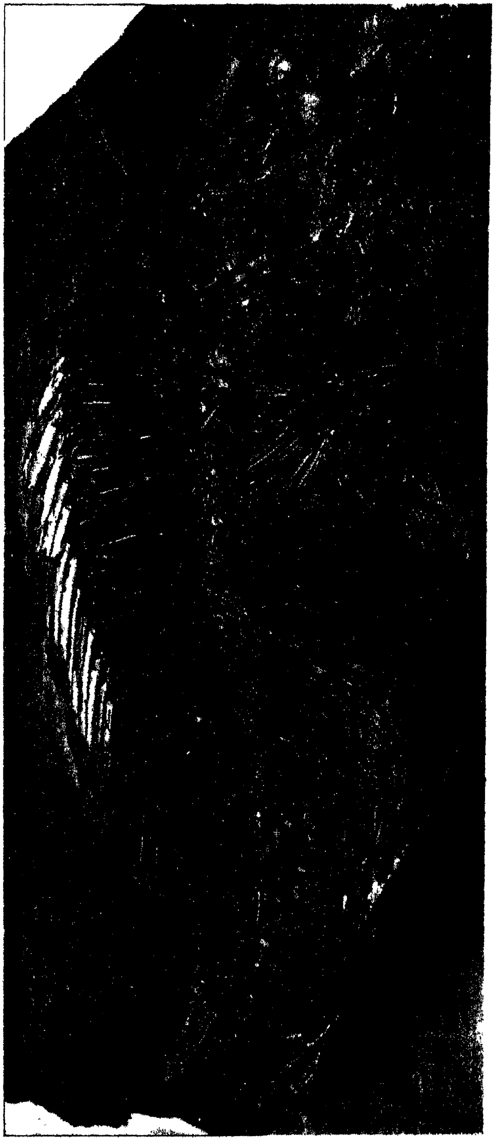


PLANKTON FROM LAKE WINDERMERE.

I

1

2



3

BRAZILIAN TERTIARY FISHES.

1, 2. KNIGHTIA BRASILIENSIS, sp. nov. 3. MACRACARA PRISCA, gen. et sp. nov.

Fig. 1.

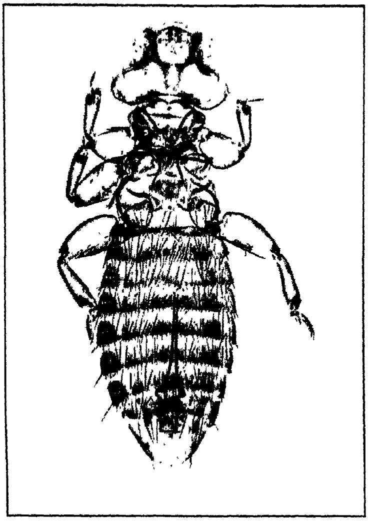


Fig. 2.

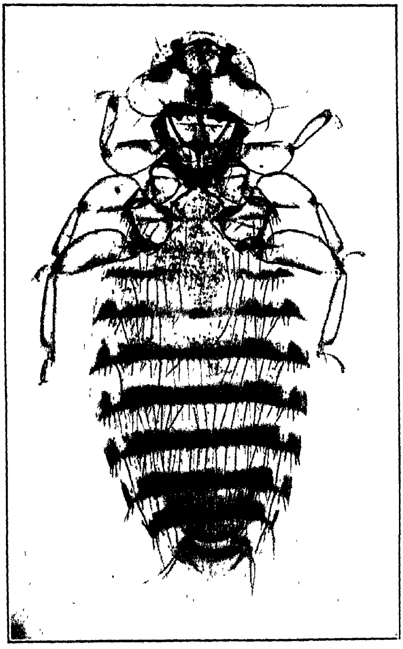
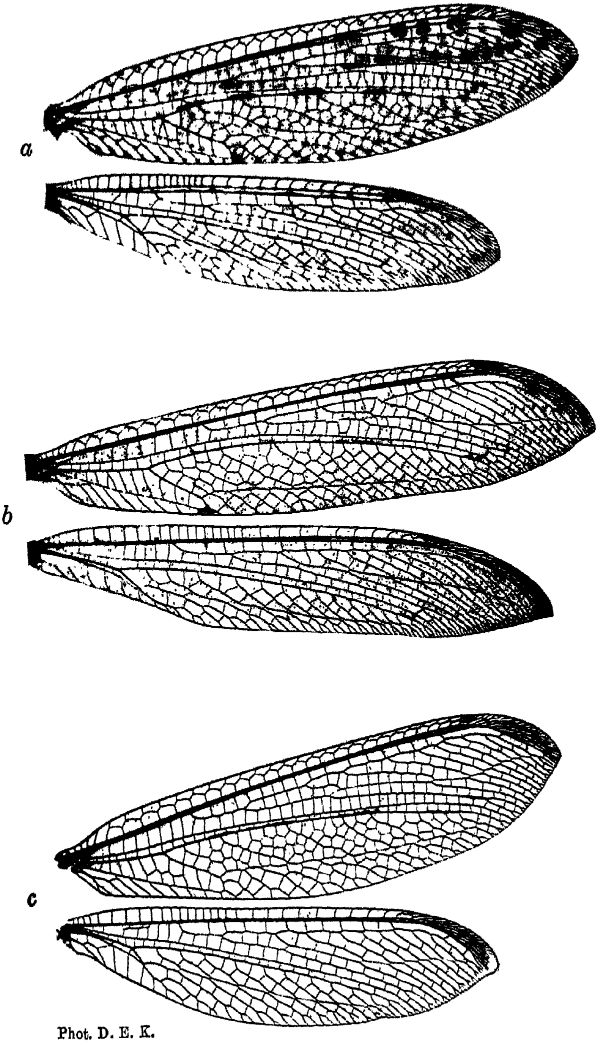
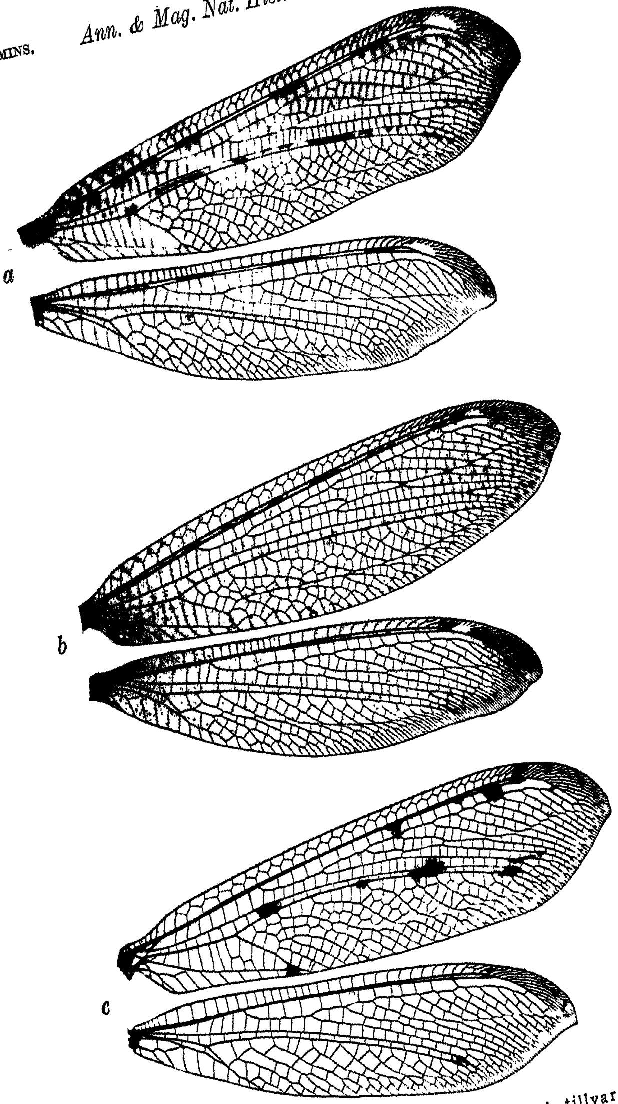


Fig. 1.—Myrsidea struthidea, sp. n., ♂.
Fig. 2.—Menopon cinerea, sp. n., ♀.



Phot. D. E. K.

Wings of: *a*, Acanthaclisis subtendens Walker; *b*, A. acuta Kimmins; *c*, A. fundata Walker.



Phot. D. E. K.

Wings of: *a*, Acanthaclisis fulvifusa Kimmins; *b*, A. tillyardi Kimmins; *c*, A. conspurcata Gerstaecker.

I. A. R. I. 75

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